S
551.5
H2d
1979

PLEASE RETURN

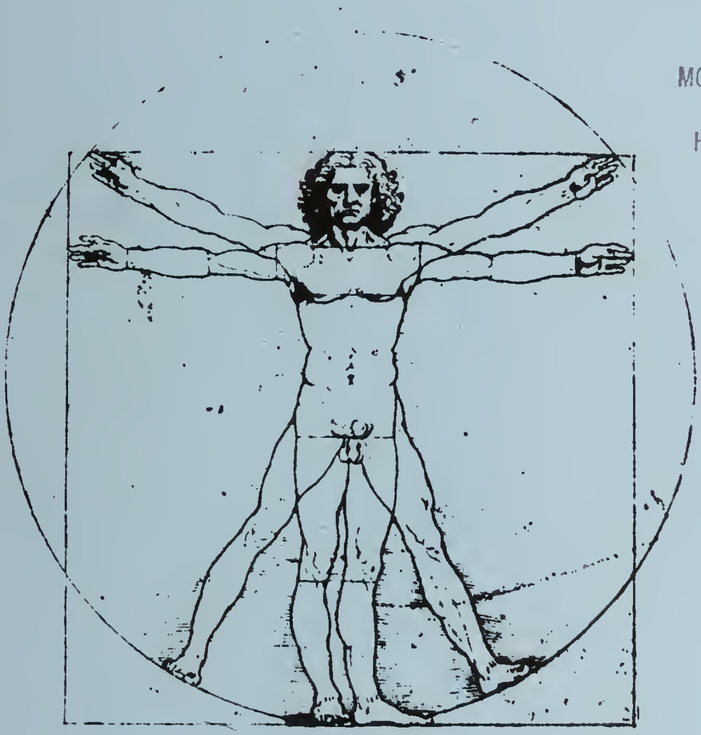
# MONTANA AIR POLLUTION STUDY

## Deer Lodge Valley Dispersion Study
## July 1979

STATE DOCUMENTS COLLECTION

AUG 20 1979

MONTANA STATE LIBRARY,
930 E Lyndale Ave.
Helena, Montana 59601



AIR QUALITY BUREAU
ENVIRONMENTAL SCIENCES DIVISION
DEPARTMENT OF HEALTH & ENVIRONMENTAL SCIENCES
HELENA, MONTANA 59601

[illegible] 4 1987

MONTANA STATE LIBRARY
S 551.5 H2d c.1 Gelhaus
Deer Lodge Valley dispersion study /
3 0864 00034687 7

# DEER LODGE VALLEY
# DISPERSION STUDY

by

James W. Gelhaus
Steven R. Harner

and

Michael D. Roach

## AIR QUALITY BUREAU

ENVIRONMENTAL SCIENCES DIVISION
DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES
HELENA, MONTANA 59601

July, 1979

Digitized by the Internet Archive
in 2013

http://archive.org/details/deerlodgevalleyd1979gelh

# PREFACE

This document is one of a series of technical reports presenting results from the Montana Air Pollution Study (MAPS), a special air monitoring and health effects project of the Air Quality Bureau of the Montana Department of Health and Environmental Sciences. The MAPS program was funded by the 1977 Montana Legislature with $1.07 million for the 1977-79 biennium in order to develop an improved understanding of the effects of air pollution on health in Montana.

The various activities undertaken as part of the MAPS effort have been grouped into five major categories for purposes of project management: Health Effects, Air Quality, Meteorology/Modeling, Emission Inventory, and Statistics and Data Systems. Each of these technical areas is presenting results in one or more technical reports prepared by the personnel directly involved in the study efforts. In addition, an overall technical summary report and a less technical report to the public will be prepared.

This specific report, in the Meteorology/Modeling area, presents results of the dispersion study conducted in the Deer Lodge Valley near Anaconda. This study was completely funded by the Anaconda Company as a provision of a stipulation with the Air Quality Bureau. Because of the direct relationship with the Montana Air Pollution Study (MAPS), this report was included in the MAPS series. The study was designed and coordinated by James W. Gelhaus, staff meteorologist with the Air Quality Bureau. The field study was conducted by Steven Harner, consulting meteorologist. Michael Roach, Air Quality Bureau Chief, served as project manager for MAPS.

## TABLE OF CONTENTS

Page

EXECUTIVE SUMMARY . . . . . . . . . . . . . . . . . . . . i

LIST OF TABLES . . . . . . . . . . . . . . . . . . . . . . ii

LIST OF FIGURES . . . . . . . . . . . . . . . . . . . . . ii

I. INTRODUCTION . . . . . . . . . . . . . . . . . . . . . 1

II. STUDY DESIGN AND ANALYSIS METHODS . . . . . . . . 4

III. DISCUSSION OF RESULTS . . . . . . . . . . . . . . . 10

- A. SURFACE METEOROLOGY . . . . . . . . . . . . . . . 10
- B. UPPER AIR METEOROLOGY . . . . . . . . . . . . . . 13
- C. CASE STUDIES . . . . . . . . . . . . . . . . . . . 24

IV. SUMMARY . . . . . . . . . . . . . . . . . . . . . . . 41

REFERENCES . . . . . . . . . . . . . . . . . . . . . . . 42

APPENDIX A - DATA SUMMARIES . . . . . . . . . . . . . . 43-A

APPENDIX B - CASE STUDY TABLES . . . . . . . . . . . . 43-B

# EXECUTIVE SUMMARY

The Air Quality Bureau of the Montana Department of Health and Environmental Sciences conducted a meteorological study of the southern end of the Deer Lodge Valley in southwestern Montana during 1978-1979. The study was conducted under funds provided by the Anaconda Company as a provision of a stipulation with the Air Quality Bureau. The study included the use of existing surface meteorological instruments at six locations. Upper air meteorology was studied for one year using pilot balloons, temperature sondes, and an acoustic radar. Data were obtained on mixing heights, atmospheric stability, and on the height, intensity, and duration of inversions, and other related meteorological parameters. All data were reduced to computer format and summarized into monthly tables. This report presents the collection methodology and data summary.

Also examined are several case studies of sulfur dioxide concentrations exceeding federal air quality standards.

# LIST OF FIGURES

| Figure No. | Description | Page |
|---|---|---|
| 1 | View of Anaconda Company Main Stack | 2 |
| 2 | View of Highway Junction Site | 5 |
| 3 | View of Meteorological Balloon Launch and Lincoln School Site | 6 |
| 4 | Map of Anaconda Area Sampling Sites | 8 |
| 5 | Flow Diagram of Anaconda Company Smelter Sampling Points | 21 |

# LIST OF TABLES

| Table No. | Description | Page |
|---|---|---|
| 1 | Air Quality Monitoring Sites | 7 |
| 2 | Holzworth Lapse Rate Categories (Modified) | 18 |
| 3 | Smelter Flue Network Listing of Physical Measurements | 22 |
| 4 | The Anaconda Copper Smelter Projected $SO_2$ Emission Parameters | 23 |

# INTRODUCTION

The Air Quality Bureau of the Montana Department of Health and Environmental Sciences conducted a meteorological study in the Deer Lodge Valley of Montana from May, 1978 through April, 1979. The study was conducted in the southern end of the valley near the Anaconda Company smelter complex as stipulated in an agreement between the Department and the Anaconda Company and came about primarily as a result of recommendations from a previous study performed by the Department of Earth Sciences, Montana State University (Heimbach, 1977). The study included the testing of diffusion models for the Anaconda smelter complex. The study tested three diffusion models using existing meteorological and air quality data in an effort to determine which model, if any, would best simulate the dispersion and resulting ground level concentrations around the smelter complex. The smelter is located in a north-south oriented valley with mountains rising up to 5000 feet above the valley to the south and west and up to 3000 feet above the valley floor on the east (See Figure 1). Due to this complex topography, the area experiences frequent and sometimes long-lived inversions. The smelter's 585 foot main stack is located on a hill rising 700 feet above the valley floor. The gases from the stack exit 1300 feet above the valley where the wind speed and direction often are different than indicated on monitoring stations on the valley floor. No information was available on the upper air meteorology of the area. One conclusion of the Heimbach (1977) report was that the most critical missing data

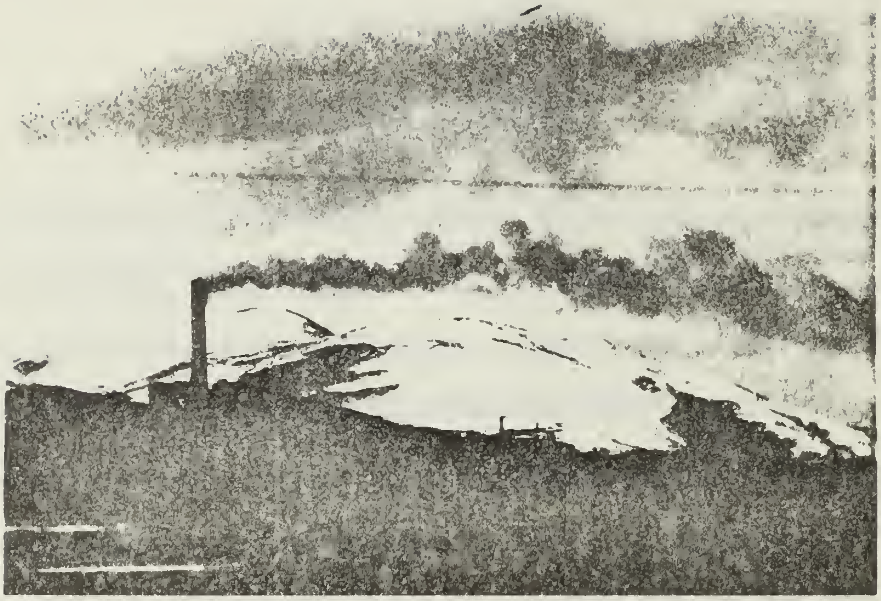


Figure 1
View of Anaconda Company main stack from the east
(above) and the southeast (below)

was mixing height information. The report also recommended the use of pilot balloons to obtain information on wind at plume height.

During the period October 1, 1976 through December 9, 1976 the Environmental Monitoring and Support Laboratory of the U. S. Environmental Protection Agency (Johnson, 1978) conducted airborne measurements of air pollutants in the Anaconda Company smelter plume at Anaconda, Montana. As a complement to the study, upper level winds were measured approximately one mile north of the smelter. However, since the study only lasted two months, the data was not of much use for diffusion modeling analysis for other times of the year.

The Deer Lodge Valley Dispersion Study was conducted primarily to provide a data base for future modeling assessments and to investigate meteorological conditions associated with high concentrations of sulfur dioxide in the area around the copper smelter.

# II. STUDY DESIGN AND ANALYSIS METHODS

Data from six air quality monitoring sites were used in the study. Two of these sites were operated by the Air Quality Bureau (see Figure 2 and 3) and four by the Anaconda Company. All six sites used (see Table 1 and Figure 4 in appendix A) contained both surface wind and sulfur dioxide instruments. Upper air instrumentation was installed at the Highway Junction site.

Meteorological data from the Anaconda Company sites were converted to standard EPA format and stored on computer tapes by Anaconda Company personnel. The data form the Air Quality Bureau (AQB) sites were reduced to hourly averages and stored on the State of Montana computer in Helena. Computer programs were written to provide summaries of upper air and surface meteorological data (Gelhaus, 1979a).

Upper air meteorological data were collected by two methods: pilot balloons with temperature sondes and acoustic radar. The pilot balloons were tracked with a single theodolite five days a week at one-half hour after sunrise and again at 1400 Mountain Standard Time (MST), weather permitting. (Gelhaus, 1979b) The pilot balloons were precalibrated for a constant ascent rate as described by Super (1972). The acoustic radar used was a monostatic acoustic sounder. The strip charts were reduced to computer format record of relative stability (stable, unstable, neutral), occurrence of meteorological events (precipitation, frontal passage, etc.), inversion base height, inversion thickness, and inversion type (laminar or spiked). The pilot balloon and temperature sonde date were analyzed to provide information on wind speed and direction;

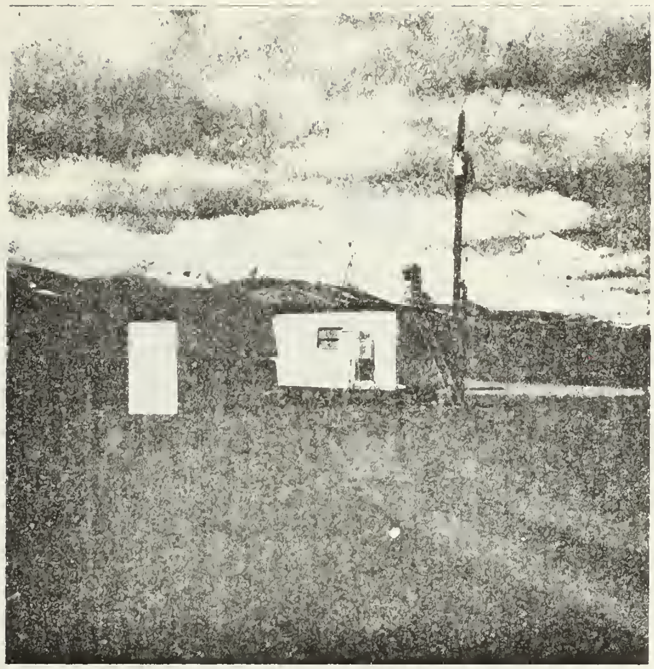


Figure 2
View of Highway Junction Site from the north (above) and the northeast (below)

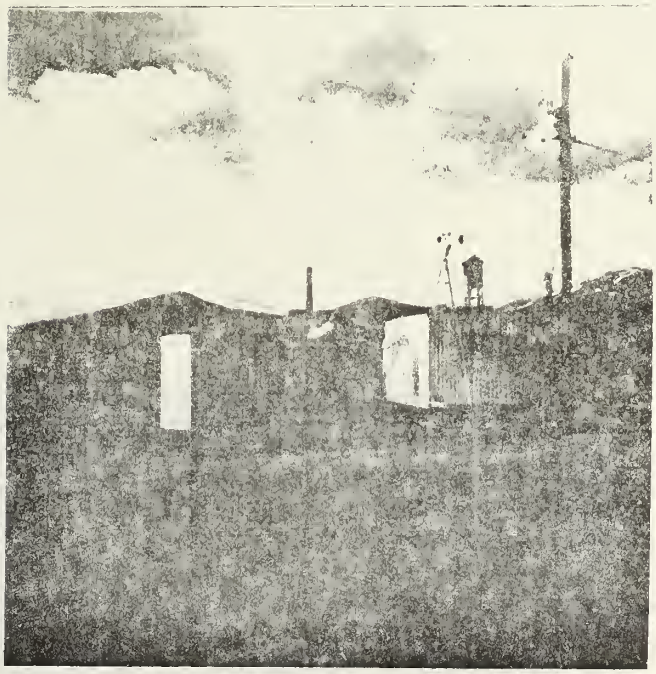
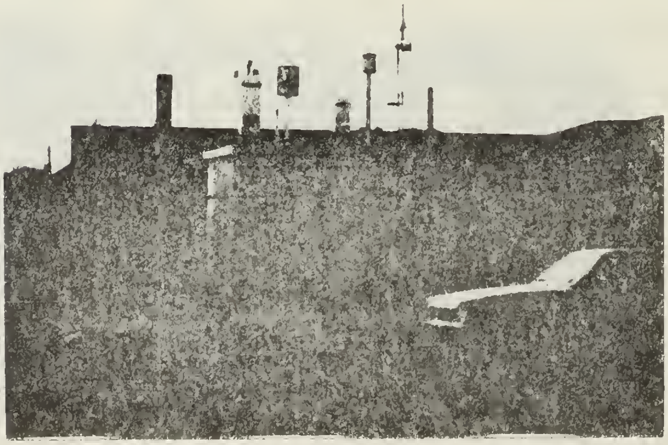


Figure 3

View of meteorological balloon launch (above)
and Lincoln School site (below)



## TABLE 1

## Air Quality Monitoring Sites

| Site | Location with respect to smelter stack | Elevation |
|---|---|---|
| Water Office Station (1) | 2.0 miles - 305° | 5332.00' |
| Lincoln School Site | 1.75 miles - 300° | 5300.00' * |
| C-Hill Station (6) | 2.0 miles - 250° | 7200.00' |
| Weather-Hill Station (5) | 0.75 miles - 185° | 6379.18' |
| Mill Creek Site | 1.5 miles - 105° | 5000.00' * |
| Highway Junction Site | 2.0 miles - 35° | 5000.00' * |

Distance and directional values are approximates
* Elevation values are approximates

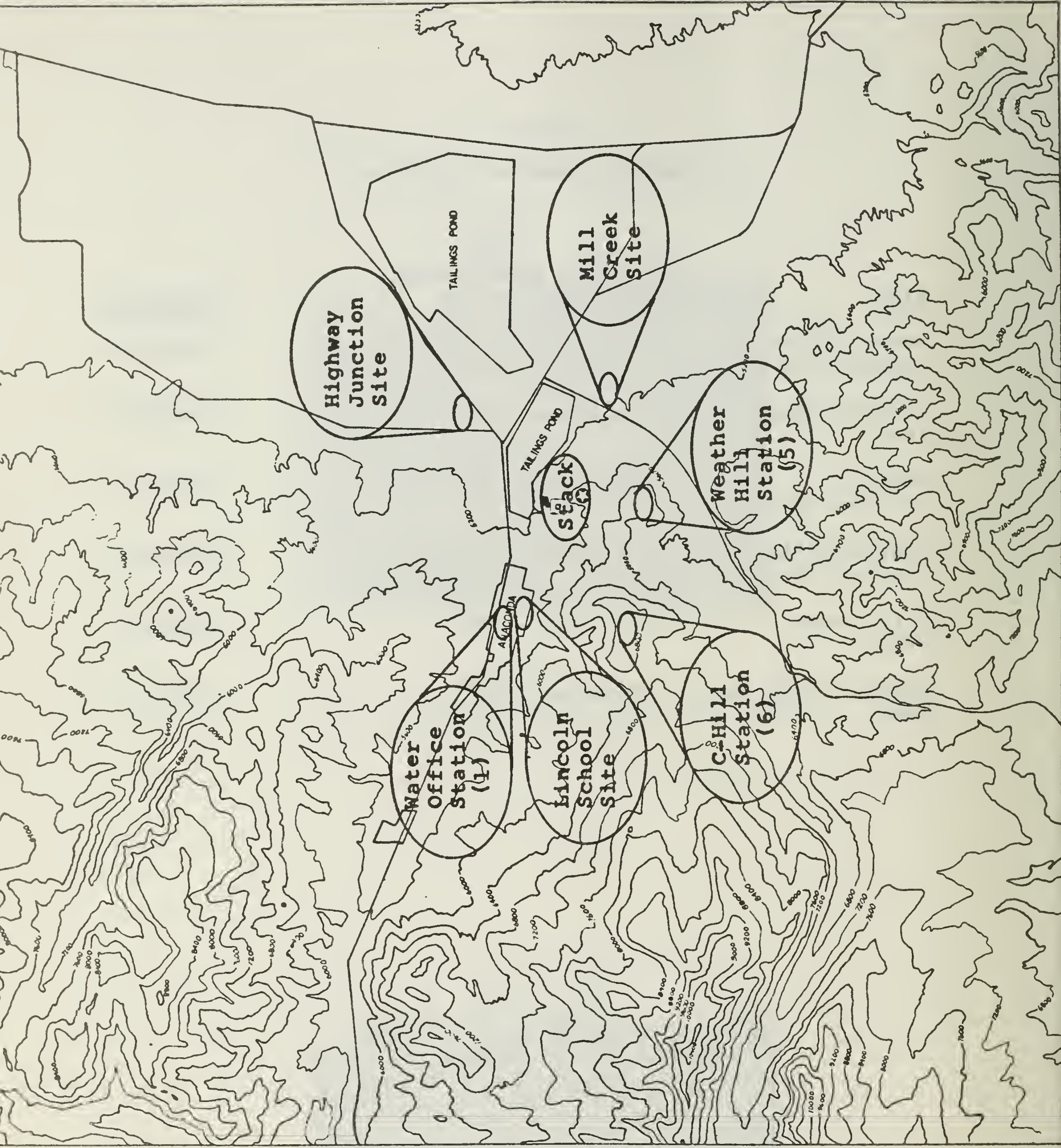


Figure 4

Map of Anaconda area sampling sites

inversion base, thickness, and strength; mixing height; and average wind speed through the mixed layer.

# III. DISCUSSION OF RESULTS

## A. Surface Meteorology

Surface wind data were assessed individually from five key sites. An intersite comparison and discussion of dispersion characteristics is also presented.

The Highway Junction site is situated at the convergence of the Anaconda Valley and the greater Deer Lodge Valley, two miles northeast of the Anaconda Company smelter. Information available for discussion dates from December 1977 to April 1979. A frequency distribution of winds indicates the most prevalent winds were from the south-southwest to north-northwest (58% annually). The southerly influence was most noticable from September through February. The northerly component was greatest during the spring. A secondary maximum (19% annually) from the north-northeast (NNE) to east-northeast (ENE) was most pronounced from May to July. Least common winds were from the northwest (NW) to north and east to southeast (total of 16% annually). The highest average wind speeds were from south-southwest to west-northwest with equal distribution throughout the year. The lowest were from north-northwest to north and east-northeast to east-southeast, again with equal annual distribution. The highest monthly average was 6.2 meters per second (m/sec) from west-north north in December and the lowest was 0.2 m/sec from North in March. Notably, the site experienced a very small percentage (0.1 percent annually) of calm conditions due in some part to the westerly drainage winds from the Anaconda Valley. These winds also contributed to the diurnal wind pattern of westerly component flow from late evening to mid-morning which was then altered by stronger prevailing winds.

Since the drainage flow and the predominant flow are both westerly, the physical properties of these winds are difficult to determine. However, their intensity during early morning was at times sufficient to overcome prevailing easterly flow (as observed by plume configuration). As expected, this pattern is most noticeable during the warmer months. Diurnal maximum wind speeds occurred around 1400 Mountain Standard Time (MST), somewhat earlier during the winter.

Data collection was begun at the Lincoln School site, located in the city of Anaconda, in July 1978. Complementary data from the Water Office site (located one-half mile from the Lincoln School site) was used to provide a full year data base. Information from the two sites was analyzed as if it had been at a single site. In all months the predominant winds were from the west to northwest (52% annually). No definite secondary maximum was noted. However, winds from the east-southeast to southeast occurred in all months (12% annually) and most frequently in July, December, and January. Least common winds were from the north-northwest to east northeast (9% annually). The average wind speed was greatest during the spring and least during the winter. The strongest average winds were from west-northwest to northwest, the maximum nrinh 5.1 m/sec from west-northwest in April. The lightest average wind speeds were from north-northwest to south-southeast, the minimum being 0.2 m/sec from the north in April. Calm conditions were infrequent at this site, 0.4 percent annually. Diurnal wind pattern were similar to those experienced at the Highway Junction site. Due to the site location, the Lincoln School area winds were not as susceptible to wind flow characteristics within the Deer Lodge Valley and the pattern was more affected by southeast winds rather than the northeast winds experienced at the Highway Junction site.

This may have been caused by geographical alteration of wind flow.

A description of C-Hill and Weather Hill sites is presented in Table 2. These sites are described at elevations relative to the smelter stack height and are useful in assessing plume trajectory.

C-Hill information was available from January 1978 to May 1978, inclusive and September 1978 and January 1979. The most common winds for all months were from the south-southeast to west averaging 61 percent, ranging from 19 percent in May to 32 percent in April. Least common winds for all months were from north-northwest to northeast. Average maximum monthly wind speeds were from the west for all months ranging from 4.7 m/sec in January 1979 to 9.8 m.sec in April 1978. The lowest average wind speed occurred in the directions of least common wind (see Appendix A for data summaries).

Weather Hill information was available from January 1978 to January 1979, except for the summer months of 1978. The most common winds were from the west-southwest to west-northwest for all months, averaging 48 percent and ranging from 31 percent in November to 59 percent in September. At this site winds from the west alone averaged 26 percent ranging from 20 percent in November to 40 percent in October. Distribution of predominant winds did not indicate a seasonal pattern for the months concerned. Winds from the east to south averaged 23 percent ranging from 15 percent in May to 34 percent in September. Least common winds were generally from the north-northwest to northeast. Average maximum monthly wind speeds were from the south to south-west and west northwest. The lowest average monthly wind speeds occurred in the directions of the least common winds.

Although these sites are useful as predictors of plume trajectories, they have an inherent major shortcoming for predicting pollutant disperion in that surface or near surface winds often are quite different than those at elevated sites. In other words, although the stack plume trajectory may be dictated by westerly winds blowing at stack height, easterly winds at the surface could disperse lower level emission or downwashed stack emissions toward the city of Anaconda. Information regarding these actions would be useful and could be accomplished with the installation of another wind system near the smelter converter roof.

The directional wind component common to all sites is westerly, accounting for over 60 percent of the total annual directional distribution for the Lincoln School and Highway Junction sites. This is a good feature for the city of Anaconda, located generally upwind of the smelter. The westerly drainage winds of the Anaconda Valley also help move pollution away from the town. However, this particular population center experiences the potentially less desirable easterly winds every month totaling over 25 percent of the annual directional distribution. Populated areas to the north-northeast and east-northeast are more distant from the pollution source but are situated in the primary and secondary wind distribution maxim. Therefore, these areas can also be exposed to elevated pollution concentrations from the smelter.

## B. Upper air Meteorology

Pilot balloons were released twice daily from the Highway Junction Site for a period of one year beginning in May 1978. From these flights, wind speed and wind direction as a function of height was computed. Wind distribution frequencies and average wind speeds were tabled for various levels up to 1500 meters above ground level (AGL). Information from the morning and afternoon releases will be discussed individually followed by a comparison study.

Review of the morning directional wind distribution indicates a shifting of directional predominance as altitude increases. At the surface the most common direction is from the SW to W (50 percent annually) for all months except November and December when south to southwest winds were most common. There was no significant secondary maximum at the surface as well as at any height AGL. However, winds from south to west-northwest comprised 73-75 percent of the annual average directional flow. The least common wind directions were from east-northwest to southeast and northwest to north northwest. At 300 meters AGL the southerly component was greater, the predominant winds were from the south to southwest (43 percent annually) for all months except May, when they flowed from the west-northwest to northwest. Winds from the south-southeast to west-northwest accounted for 77 percent of the annual distribution. The least common directions were northeast to southeast. At 750 m AGL a definite reversal occurs. The predominant winds are then from west southwest to west northwest (57 percent annually) for all months and winds from the south to west northwest comprise 83 percent of the annual distribution. The least common directional flow is northeast to southeast. At 1500 m AGL the predominant winds are from north to northwest for all months except February and May when the most common winds were from the southwest to west. Winds from the southwest to northwest accounted to 75 percent of the average annual distribution. Least common winds were from north northeast to south. Wind speeds at all levels were directly proportional to the highest and lowest frequency distributions as well as increasing heights.

The afternoon distribution of upper air winds is more complex than in the morning. At the surface there is a bimodal distribution of predominant winds. During the summer and spring the most common directions are from north to east (38 percent annually) and during the winter and autumn the most common winds are south-southwest to west-northwest (41 percent annually).

For all months the least common directions are east southeast to south and northwest to north-northwest. At 300 meters AGL the most common winds are from south southwest to west northwest (52 percent annually) except during the months of summer and the month of January, where the predominant flow is from north to northeast. This directional arc is also the secondary maximum comprising 30 percent of the average annual distribution. Least common winds were from east-northeast to south for all months. At 750 meters AGL the most common wind directions were from southwest to west-northwest for all months making up 86 percent of the average annual distribution and directional flow from south-southwest to northwest accounted for 72 percent. Least common wind directions were north-northwest to south. At 1500 meters AGL the most common wind directions were southwest to west-northwest again (67 percent annually) with winds from southwest to northwest accounting for 80 percent of the annual distribution. However, from November to May the most common winds shift to the west-southwest to northwest. The least common winds were from north northwest to south southwest. Ths generalization made regarding winds speeds during the morning measurements also holds true for those made in the afternoon.

A review of morning and afternoon upper air winds indicates the diurnal differences and the heights to which they are extended. Thes differences are most pronounced at the surface due primarily to the drainage winds this area experiences at the time of morning measurements. Note the dissipation of this effect in November and December when temperatures were low and snow cover persistent. The magnitude of difference decreases with height as winds become less influenced by drainage winds and topography.

Mixing heights were computed from pilot balloon temperature soundings originated at the Highway Junction site between August 1978 and April 1979. In the morning, mixing heights of near zero to 100 meters were most common for all months except December and April, averaging 38 percent and ranging from 67 percent in October to 22 percent in December. The majority of mixing heights were from near zero to 250 meters for all months except September. For all months, at least 64 percent of all mixing heights were from near zero to 750 meters. Mixing heights greater than 1500 meters occurred only in October and March, an average of 6 percent. Average wind speeds through the mixed layer were greatest in October and December and the lowest in January (which had 100 percent of the mixing heights less than 500 meters). For both the autumn and winter the majority of mixing heights were from near zero to 250 meters. However, mixing heights greater than 500 meters were more common to autumn. Likewise, average wind speeds through the mixed layer were greater during autumn.

The most common afternoon mixing heights were greater than 250 meters, occurring at least 75 percent of the time for all months. Mixing heights greater than 1000 meters occurred 39 percent of the time, ranging from near zero in January to 79 percent in October. Mixing heights from 250-500 meters occurred an average of 52 percent of the time in November, December and January. A seasonal variation is evident: mixing heights greater than 1000 meters are more common in all but the winter months. Therefore, average wind speeds through the mixed layer are greater in those months with the greater mixing heights, from 7.5 m/sec in April and September to 3.5 m/sec in January. Furthermore, they are stronger than their morning counterparts. The autumn season has no mixing heights less than 250 meters with 52 percent greater than 1000 meters. Conversely, the winter season had mixing heights from near zero to 250 meters 18 percent of the time, but only 16 percent greater than 100 meters.

Inversion information was also computed from the temperature soundings performed between August 1978 and April 1979. Inversions were categorized according to their base height and thickness. Also, each was assigned a Holzworth strength classification 1 through 5, 1 being the weakest and 5 being the strongest (see Table 2).

Morning inversions were mostly surface based with a thickness ranging from 1-250 meters. These were mainly Holzworth type 3. Elevated inversions had base heights ranging from 100-1500 meters with little definite seasonal pattern. These were generally thinner (1-100 meters) and less intense (Holzworth type 1) than the surface based inversions. Inversions were absent an average of only 3 percent per month. For all months, distribution of inversion parameters were similar.

There were very few afternoon surface based inversions, occurring only in November, December, January and March. Most base heights were greater than 250 meters and varied considerably. The most common thickness were from 1-250 meters. These were mainly Holzworth types 1 and 2. The stronger afternoon inversions were generally based from 250-750 meters aloft. There was no definite monthly distribution patterns except for the no inversion occurrence figures. The months of October through January experienced no inversions an average of only 2 percent per month as compared to an average of 24 percent for the other months.

In the morning, surface-based first inversions averaged 75 percent for all months, as compared to 12 percent in the afternoon. Average lapse rates in the first inversion were greater (more intense inversion) in the mornings

TABLE 2

Holzworth Lapse Rate Categories (Modified)
Values in deg C/100m

| Non-Inversion Class | Lapse Rate | Description |
|---|---|---|
| 1 | $< -1.60$ | Very Superadiabatic |
| 2 | -1.21 to -1.60 | Superadiabatic |
| 3 | -0.81 to -1.20 | Near Dry Adiabatic |
| 4 | -0.41 to -0.80 | Near Standard Atmosphere |
| 5 | 0.00 to -0.40 | Weak Lapse |

| Inversion Class | Lapse Rate | Description |
|---|---|---|
| 1 | 0.00 to +0.47 | Weak Inversion |
| 2 | +0.48 to +1.14 | Moderate Inversion |
| 3 | +1.15 to +2.82 | Strong Inversion |
| 4 | +2.83 to +6.00 | Very Strong Inversion |
| 5 | $> +6.00$ | Extreme Inversion |

(Holzworth, 1974)

(1.7 degree C/100 meters) than in the afternoon (0.8 degree C/100 meter). A winter seasonal variation is apparent: the occurrence of afternoon surface-based first inversions and their intensity increase whereas in the mornings a decrease in occurrences is noted.

As previously mentioned, mixing height and inversion information was computed from temperature sounding data. Monthly and seasonal averages of these soundings have been plotted for September of 1978 through April 1979. These clearly indicate the large monthly variations in atmospheric temperature profiles. This is most noticeable during the winter season as the atmosphere cools less rapidly with respect to height. Dry adiabat lines have been plotted on the morning profiles to indicate the average monthly mixing heights.

Stability was initially determined from interpretation of acoustic radar records. Further analysis as to frequency and degree of stability was made using cloud height and cover and wind speeds (Gelhaus, 1979b). The stabilities were determined for two-hour periods throughout the day for the months dating May 1978 to March 1979. The data indicates the expected distribution of the various categories for this area. During the summer the greatest percentage of readings were in the neutral to moderately unstable categories. However, with the approach of winter the greatest percentage of readings were in the neutral to slightly stable categories. It must be noted that cloud height and cover data used in stability determination were obtained from Butte, Montana Federal Aviation Administration (FAA) observations. Actual meteorological conditions in Anaconda are quite often much different than those experienced in Butte, particularly in the winter and spring seasons. Also, a large portion of stability data could not be calculated because of missing FAA observations. Frequency tables of first (lowest) and second (second lowest of multiple inversions) inversions were also derived from acoustic radar records. Most first inversions for all months were surface based. During May and June most inversions were 100-300 meters thick. For the months of July through September, inclusive, the inversions were equally 0-100 and 100-300 meters thick. However, the continuing trend indicated that by November inversions 300-500 meters thick were nearly as frequent as those of 100-300 meters. A reversal of trend occurred in December, and by February most first inversions were again 100-300 meters thick. Daily inversion analysis was separated into six-hour block beginning at midnight (0000 MST). Continuation of inversions did not extend into the 0000-1200 MST block until September and continuation or formation of inversions did not extend into the 1200-1800 MST block until November. This individual trend was essentially reversed by March of 1979.

Second inversions were infrequent and occurred primarily from November to March. These were mostly based from 200-400 meters and were 100-300 meters thick. Generally, these are not as intense as the first inversions particularly those with base heights greater than 400 meters.

The average monthly inversion formation times and lifting times are a function of the time of the year and the associated radiational affect. During the year the formation time varies from 2000 MST in June to 1700 MST in January. Lifting times for the same months are 0630 MST and 1030 MST respectively. The inversion angle of ascent (rate of rise from the surface relative to a two hour time period) in June averaged 175 meters as compared to 90 meters in January. This measurement can be complicated by a variety of meteorological events or conditions. Snow cover in the winter often prevented an inversion from breaking up, resulting in its continuation for more than one day. Also events such as heavy precipitation, high winds or frontal passage often resulted in abrupt breakup of an inversion.

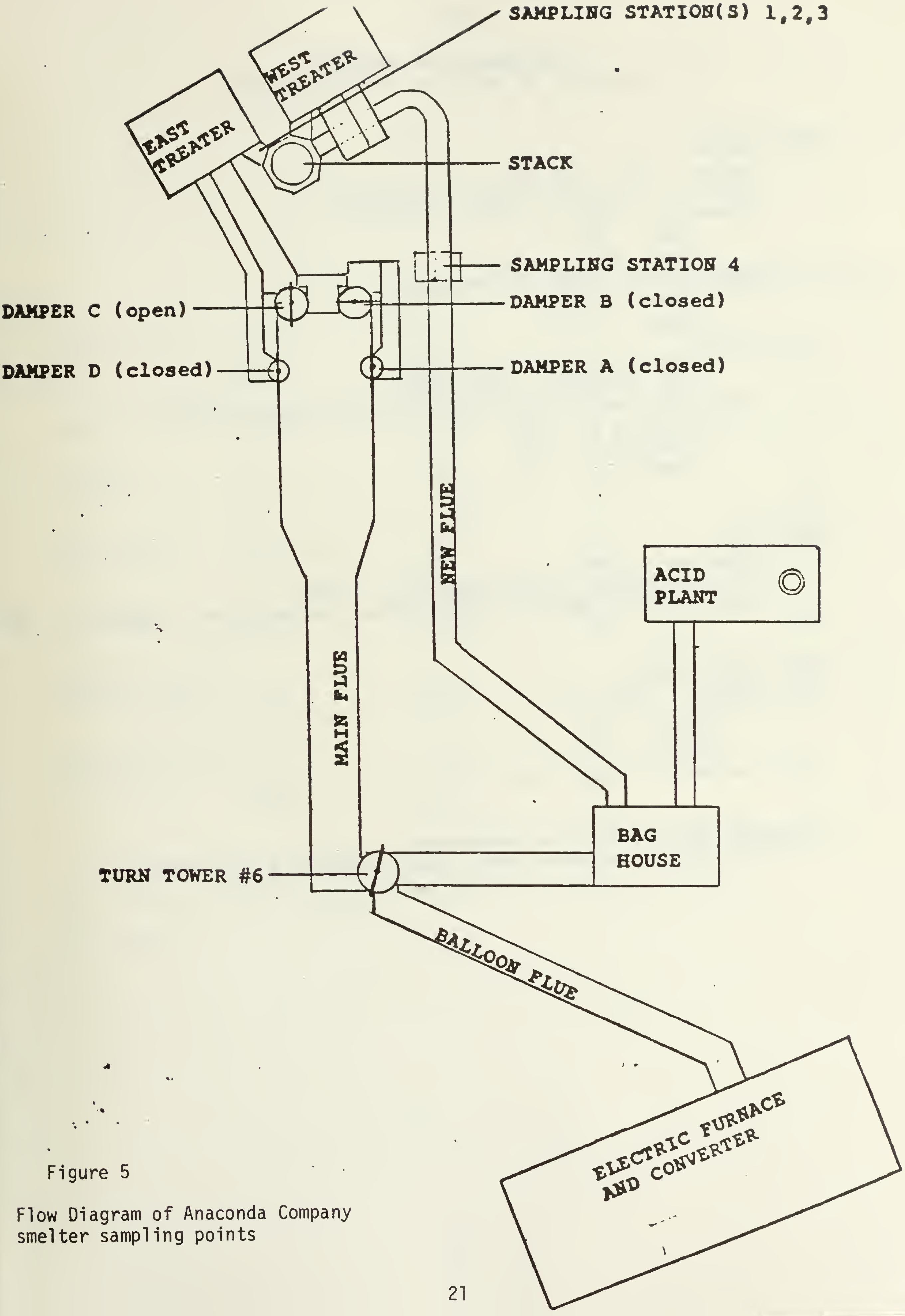


Figure 5

Flow Diagram of Anaconda Company smelter sampling points

## TABLE 3

## SMELTER FLUE NETWORK
## LISTING OF PHYSICAL MEASUREMENTS

**MAIN STACK**

- Height - 585' 1-1/2"
- Elevation (base) - 5754' U.S.G.S.
- Diameter (I.D.)
  - Base - 75' 4"
  - Top - 60'
- Temperature Probe Elevations
  - Lower - 150'
  - Upper - 450'
- Inlets
  - New Flue - 16' diameter
  - East Treater - 16' x 60'
- Sampling Station Elevations (above base of stack)
  - Station 1 - 10'
  - Station 2 - 30'
  - Station 3 - 50'

**NEW FLUE**

- Diameter - 16'
- Length (approx. from Baghouse) - 2240'
- Sampling Station 4 Location (from stack inlet, approx.) - 390'

**ACID PLANT STACK**

- Height - 170'
- Diameter (I.D.)
  - Base - 14'
  - Top - 7'
- Elevation (top) - 5742' 7"

**CONVERTER ROOF** (Fugitive Emissions)

- See note on commissioned study and table of values

## TABLE 4

## THE ANACONDA COPPER SMELTER
## PROJECTED $SO_2$ EMISSION PARAMETERS

| | | Main Stack | Acid Plant Stacks (2 each) | Fugitive (Converter Building) |
|---|---|---|---|---|
| Base Elevation (MSL) | (ft) | 5,875 | 5,450 | 5,403 |
| | (m) | 1,791 | 1,660 | 1,650 |
| Heights | (ft) | 585 | 170 | ---(2) |
| | (m) | 178 | 51.8 | --- |
| Diameter | (ft) | 60 | 6.9 | 125 |
| | (m) | 16.3 | 2.1 | 38.1 |
| Temperature | (°F) | 160 | 160 | 90 |
| | (°K) | 344 | 344 | 305 |
| Flow Rate | (scfm) | 300,000 | 85,000 | 2,610,000 |
| | ($m^3$/sec) | 236 | 40.2 | 1,230 |
| $SO_2$ Emission Rate (24 hr. avg.) | (lb/hr) | 11,800 | 907(1) | 2,000 |
| | (g/sec) | 1,490 | 114 | 250 |
| $SO_2$ Emission Rate (6-hr avg.) | (lb/hr) | 16,800 | 907 | 2,000 |
| | (g/sec) | 2,120 | 114 | 250 |

(1) Based on limit of 1,000 ppm $SO_2$

(2) Variable, based on assumed characteristic lengths for modeling

(ERT, 1978)

## C. Case Studies

Case studies were made for all four seasons, individually. Criteria for all case study selections were: high and persistent sulfur dioxide ($SO_2$) measurements and the availability of the maximum amount of supporting meteorological emission data. Sulfur dioxide levels were measured at various sites in the area. A different site with high $SO_2$ levels was chosen for each seasonal case study. However, $SO_2$ and wind data from the four sites chosen are presented in each case study. The four sites chosen create a rough circumference about the emission source (see Figure 5) and are representative of different areas and population densities.

The case studies are presented for two purposes. The first purpose is to show a correlation between measureable meteorological parameters and pollution potential, and the second is to provide information that can be used in diffusion model calibrations.

Diffusion models require emission data along with information on meteorology and air quality. Utilization of these data require some knowledge of the emission sources and the methodology of the emission measurement.

Temperature lapse rate data from the Anaconda Company's C-Hill meteorological tower were compared with lapse rates obtained from the temperature soundings to determine whether the C-Hill data could be usable for future stability evaluations. Lapse rates were determined for the same time, using the same surface temperature. The C-Hill sensor is at an elevation of 2175 meters, 250 meters higher than the smelter stack. Data collected from August 1978 to March 1979 indicates relatively good comparisons between the temperature sonde and the C-Hill sensor for both the morning and afternoon measurements, with the exceptions of October and November 1978.

The Anaconda Company Copper Smelter discharges effluent from three primary sources, the furnace and converter rooms, the acid plant, and the main stack. The ability to mathematically model the dispersion of pollution from the three sources depends on several variables. A description of how these variables are measured as well as a description of the source areas will be given in order to assess the data presented in the tables. Refer to Figure 5 and Table 3-4 in conjunction with the description as follows.

Sulfur dioxide ($SO_2$) originates in the building that houses the electric furnaces and converters. These are actually two separate buildings but will be treated as one. Here the ore concentrate is subjected to a thermal reduction process and the $SO_2$ is given off. Pollutant trapping systems are not totally effective on these sources so they escape out of the buildings into the atmosphere. These emissions have not been measured. However, a study (ERT, 1978) commissioned by the Anaconda Company estimated these emissions. Roof emission temperatures are assumed to be near ambient. The emission estimates along with the production rates for those periods covered by the case studies, will be presented. Note: The Anaconda Company plans installation of more effective pollution control devices in this area so present emission levels will decrease.

Pollutants captured in the furnace and converter rooms travel through the balloon flue network into either the old main flue or the baghouse. Although the old main flue is seldom used, some of all of the emissions are diverted through it into the ambient air when the baghouse is inoperative. This creates a modeling problem in that no $SO_2$ measurements are taken at the stack during periods of by-pass. This lack of measurement can be remedied somewhat with a series of calculations which will be discussed later.

Upon entering the baghouse most of the particulate matter is separated from the gases. A regulated amount of these gases is then diverted to the acid plant. Here, most of the $SO_2$ is converted into sulfuric acid. The remainder is emitted out of the acid plant stack, which is the second primary source of effluent from the plant. At the base inlet to the stack, the flow rate, $SO_2$ concentration, and temperature are measured. The Anaconda Company plans to construct additional $SO_2$ control devices which would require changes to be made to the present emission parameters.

Gases not diverted from the baghouse to the acid plant pass through a flue into the main stack. The measurements necessary for modeling are made at sampling station 4, in the flue leading to the main stack. Measurements at stack exit can be computed given static physical properties which will be listed.

Gases entering from the new flue are one of two sources of input into the main stack, which is the third and largest source of effluent emissions. Infiltrated air enters the stack via the east and west treater buildings. The main flue and east treater are essentially inoperative and nonmaintained. For these reasons, plus the fact that they are old and decaying, large volumes of air are allowed to enter them. Infiltrated air in the main flue enters the east treater via damper C which is open (100 sq. ft. opening). This air is then pulled into and up the main stack via its convective mechanics. Air entering the main stack from the east treater is heated to control condensation and enhance its bouyancy. The $SO_2$ concentration of this air is not measured. However, the volume is measured at sampling station 1,2, and 3, once a day and the values averaged. Therefore when smelter emissions are vented up the main flue, flow can be measured but not $SO_2$ concentration. This concentration will have to be determined from data presented. The problem will be minimal due to the infrequent use of the main flue. The west treater building was sealed off from the main flue April 27, 1979. Until that time gases entering the west side of the main stack were a combination of new flue gases and air infiltrated through the west treater. The flow rate of air infiltrated through the west treater can be deduced by subtracting the flow rate through the new flue from the total flow through the west treater.

### Summer Case Study (C-Hill Site)

See Figure 4 for a description of the C-Hill and other site locations. The C-Hill site experienced high sulfur dioxide ($SO_2$) levels on the 29th and 30th of August, 1978 (Appendix B). The concentrations varied within this period as a function of various meteorological parameters. A description of these parameters and a correlation between these and pollution episodes is presented for each case study.

The synoptic situation was characterized by the transition from a surface high pressure area over Montana on the 28th to a low pressure influence by the 31st. A transitional front northeast of Montana on the 28th had reached into central Montana by the 30th. This, along with the high pressure system generated easterly winds. By the 31st the front had become a weak warm front retreating to the northeast ahead of westerly winds. The 500 mb flow over the area was westerly, disrupted somewhat by a short wave disturbance passage. FAA observations taken at Butte indicated clear to scattered cloud conditions from the 28th to 30th. However, by the 31st the low pressure influence had created some cloud cover.

Stability and inversion information was recorded continuously during this period with the aid of an acoustic radar system. A surface based inversion formed at 2000 MST on August 28, 1978 and continued until 0700 MST on August 29, 1978. The inversion was most intense in the first 100 meters but extended up to 200 meters during the entire period. At 0700 MST on the 29th it began lifting from the surface and continued for two hours, obtaining a base height of 160 meters (approximately 40 meters thick) before dissipating. The period from 0800 MST to 1600 MST was characteristically unstable with positive vertical mixing. From 1600 to 1900 MST the atmospheric conditions were neutral. At 1900 MST a nocturnal surface based inversion formed and continued until 0700 MST on the 30th. Again the inversion was most intense in the first 100 meters, although it was 300 meters thick by 0500 MST on the 30th. At 0700 MST it lifted from the surface and obtained a base height of 450 meters four hours later before being destroyed by upper air winds. The surface condition from 0800 to 1600 MST was again characteristically unstable. Local precipitation occurred at 1550 MST destroying the thermal (vertical) activity and bringing cool air to the surface, creating a weak inversion 300 to 100 meters thick. This continued until 2100 MST when radiational cooling intensified the inversion, which extended into the 31st.

Pilot balloons and temperature sondes were released four times during the August 29 and 30 period, and from these various atmospheric meteorological parameters were computed.

At 0625 MST on the 29th a pibal was released to obtain upper air wind data. The data indicated a 296 degree shift in winds from the surface to 1500 meters AGL. At the surface winds were from 260 degrees but at 750 meters AGL they were from the north northeast (18 degrees). However, at 1500 meters winds were from the south southwest (196 degrees).

Information obtained from the 1400 MST pibal release (on the 29th) indicated winds at all levels had an easterly component except at 300 meters AGL. The strongest winds (5.1 to 8.4 m/sec) occurred at the 500 and 750 m AGL levels.

Temperature sounding at the same time indicated a mixing height of 540 meters with a moderate, average wind speed (4.2 m/sec) through the mixed layer. The sounding also indicated an elevated first inversion based at 800 meters AGL. This was a thin (55 meters), weak inversion. The lapse rate below this inversion was slightly less than adiabatic, accounting for the relatively shallow afternoon mixing layer.

A pibal was released at 0625 MST on the 30th. Winds throughout the first 1500 meters AGL were light and predominantly westerly. The temperature sounding corresponded well with acoustic radar data, indicating a surface based inversion 160 meters thick and relatively intense (1.682 deg C/100 m). This created the very shallow mixing height (80 meters). Inversion conditions (albeit weak) were from 200 to 700 meters.

The afternoon (1400 MST) release on the 30th indicated northeast winds from the surface to 500 meters. At 750 meters the winds were the strongest from the east-southeast (100 degrees). At 1000 meters AGL the prevailing winds were westerly. There were no inversions in the first 1500 meters AGL. However, the actual lapse rate was less than adiabatic, so the mixing height was only 320 meters.

The C-Hill site is located two miles to the west-southwest of the smelter works atop a hill (C-Hill) approximately 250 meters higher than the smelter stack elevation. Winds recorded at this site on the 29th were unusually light (0.5 to 4.0 m/sec) and variable. However, an easterly component was predominant for most hourly directional averages. The strongest winds occurred from 0800 to 1400 MST and ranged in direction from 100 to 137 degrees. On the 30th easterly winds were predominant during the hours from 1000 to 1400 and 1900 to 2300 MST. On both the 29th and 30th almost all hours recorded $SO_2$ readings but the greatest concentrations occurred when C-Hill wind directions were from 90 to 150 degrees.

Winds recorded at the Weather Hill site were also light and variable on the 29th but with a noticeable easterly component. The $SO_2$ monitor at the Anaconda Company's Mill Creek site is to the south of and in line with the Weather Hill site and smelter stack. Readings at this monitor indicated small $SO_2$ hourly concentrations. These readings were mainly the result of light winds and subsequent large horizontal pollutant dispersion. However, on the 30th winds were stronger and less variable and a westerly component most noticeable causing the $SO_2$ readings at Mill Creek to drop to near zero.

Winds recorded at the Highway Junction and Lincoln School sites were primarily westerly due to the Anaconda Valley drainage winds. The easterly winds present on both the 29th and 30th extended their influence into the valley only in the afternoons. It was during the afternoon of both days that the highest $SO_2$ readings were recorded in the valley. Sulfur dioxide values used for this study were taken from the Water Office site, since the $SO_2$ monitor at the Lincoln School site was out of operation; due to the proximity of the two sites $SO_2$ and wind records from the two can be considered interchangeable. The $SO_2$ readings at the two sites may have been a result of fugitive emissions rather than stack emissions.

For this particular situation the basic cause for a pollution potential was the surface high pressure system located over Montana. This system inhibited vertical mixing and generated relatively light winds. It was these light winds (from the surface to 1500 meters AGL) that determined where the pollution potential would be. In this case winds were from the east to northeast dispersing pollutants in the direction of the C-Hill site. However, these winds were light and variable enough to create $SO_2$ readings at all other sites during some hours. Notably, the westerly drainage winds were dominant in blocking the easterly winds from dispersing the pollutant into the city of Anaconda for all but a few hours in the afternoons. Inversion conditions experienced during the morning and late evening hours were surface based and may have acted to keep the $SO_2$ plume from reaching the ground. The inversion, along with the drainage winds, kept the $SO_2$ readings at sites in the town low during this period. Conversely, the character of the afternoon lapse rates limited vertical mixing. This limited mixing in combination with the variable easterly winds created the afternoon surface pollution potential.

Note: lower level emissions from the converter roof and acid plant may often have much different dispersion characteristics than stack emissions. Thus, the emission sources may each comprise a different pollution potential due to meteorological parameters at the different elevations. Very little is known as to the distinction between dispersion conditions of the sources. This uncertainty is inherent in all of the case studies. For air quality and modeling purposes, more information is needed on the dispersion characteristics of the various sources and their interrelationships.

### Autumn Case Study (Lincoln School Site)

The Lincoln School site experienced high $SO_2$ levels on both the 5th and 6th of October, 1978. Meteorological conditions were similar to those as described in the summer case study.

The synoptic situation was characterized by the movement of a surface high pressure system into the area centering over northcentral Montana at 0500 MST on the 5th. The area remained under the influence of this high until the 7th.

Winds at the 500 mb heights were primarily northwesterly over the Anaconda area during this period. Sky conditions (as observed at Butte, Montana FAA) on the 5th and 6th were generally clear to high overcast. No precipitation was recorded.

Acoustic radar records indicated a surface based inversion formed at 1845 MST on the 4th. The inversion was 200 meters thick until 0000 MST on the 5th. At this time multiple layers of inversion extended to 400 meters and continued as such until 0800 MST on the same day. At this time it began lifting from the surface. It quickly reached a base height of 140 meters and remained at that height for two hours before being destroyed by vertical mixing. The period from 0800 to 1700 MST was characteristically unstable at the surface. At 1830 MST on the 5th a laminar radiation inversion formed and grew in thickness from 100 to 400 meters by 0230 MST on the 6th. At 0845 MST on the 7th it began lifting. Traces of the elevated inversion were discernible as late as 1400 MST, with a base height about 400 meters. Again the surface was characteristically unstable from 0900 to 1700 MST. At 1740 MST another nocturnal inversion began forming and conditions continued into the 7th day of October.

Upper air wind information obtained from the 0710 MST pibal release on the 5th indicated a shift from an easterly wind (240 degrees) at the surface to more southerly winds by 750 meters AGL (160 degrees). A temperature sounding taken at the same time indicated multiple inversion layers up to 2000 meters. The most intense was a surface based inversion 300 meters thick. The second inversion was based at 430 meters and was 215 meters thick. This inversion layer was at the same elevation at which stack gases are expelled. South-southeast winds were observed at the height of the second layer.

The afternoon (1400 MST) pibal release on the same day indicated northeasterly winds at the surface shifting to easterly by 500 meters AGL. The shifting continued as greater elevations were reached, from southerly winds at 750 meters to westerly winds at 1500 meters AGL. The temperature sounding indicated good vertical mixing up to about 1090 meters AGL.

A temperature sounding taken at 0715 MST on the 6th indicated an almost continuous, moderately intense inversion existing from the surface to 800 meters AGL. Winds at all levels were southwesterly but generally light at this time. The afternoon pibal release and sounding indicated very similar conditions as these observed during the afternoon of the 5th.

Surface winds recorded at the Lincoln School site (located west-northwest of the smelter) were very similar for both the 5th and 6th. Westerly flow influenced by the drainage winds (mountain-valley winds) was predominant for most hours except those from 1000 to 1800 MST, at which times easterly component winds were most common. Wind speeds ranged from 0.9 to 3.0 m/sec, the lightest generally occurring during the afternoon. $SO_2$ readings were noted during all hours of this forty-eight hour period. Maximum $SO_2$ concentrations for both days occurred during the afternoon. These higher readings were a result of easterly winds invading the Anaconda Valley dispersing pollutants from all sources at the smelter works. The $SO_2$ readings observed during the morning and nighttime hours of the 5th were the result of stronger easterly winds transporting stack gases trapped within an elevated inversion toward the site. However, monitoring indicated there were westerly winds (drainage winds) below the inversion. This sheer layer may have oscillated in wave form bringing pollutants from the inversion to the surface. Emissions from the roof and acid plant sources were not a factor in these $SO_2$ readings as they were confined in the surface based inversion and dispersed by the westerly drainage winds. However, it seems likely that the Mill Creek site (located to the east of the smelter) received $SO_2$ during the morning and nighttime hours on both the 5th and 7th from these sources. A notable exception occurred on the 6th when $SO_2$ levels recorded at the site were unusually high from 0200 to 0700 MST. Surface wind and winds aloft (at 0715 MST that morning) indicated winds from the southwest to northwest. The high $SO_2$ readings must therefore be assumed to have resulted from the very deep (800 meters) inversion trapping the pollutants and the occurrence of easterly component winds aloft during the early morning. C-Hill wind data were not available for this study, but $SO_2$ levels at the C-Hill site were also significant during this case study, supporting the assumption that easterly winds did occur during this case study.

Winds at the Highway Junction site were very similar to those recorded at the Lincoln School site for both days. $SO_2$ levels at this site were greatest during southerly wind periods (the site is located northeast of the smelter) during the transition from drainage flow to prevailing easterly flow and vice-versa.

Again the basic cause for pollution potential for this case study was the high pressure system situated over the area. This pressure system created stagnant conditions with varied dispersion characteristics. In this case the dispersion or transport of pollutants was as much a function of the local meteorology (i.e. drainage winds and atmospheric lapse rates) as synoptic meteorology.

## Winter Case Study (Highway Junction Site)

High levels of $SO_2$ were recorded at the Highway Junction Site for a majority of the hours from the 8th to the 14th of February, 1979. This case study will examine two days out of that period, the 9th and 10th. These were chosen for several reasons: the pollution potential existed for the full forth-eight hours, supporting data was most available for this period, and the effect of operations curtailment (mandated by regulations concerning pollution levels) could be assessed.

The surface synoptic situation during this period was complex. A high pressure area center over eastern Utah remained stationary from the 8th through the 11th. A stationary front oscillated between west central and central Montana during this period. This front created a packing of low pressure areas parallel to the front. The results of the two systems were strong southerly winds as evidenced by the warmer than seasonal temperatures recorded during this period. However, since the high pressure system was located over the Rocky Mountains, the topography greatly influenced localized wind conditions near the surface. Winds at the 500 mb heights were westerly during this time.

A pibal released from the Highway Junction Site at 0815 MST on the 9th indicated strong surface winds from the south-southwest (210 degrees). At 200 meters the winds were from the southwest (233 degrees). The shifting continued through different levels, and by 750 meters AGL, winds were from the west, 276 degrees. This was in contrast to the C-Hill reading of 200 degrees. A temperature sounding at the same time showed a surface based inversion 110 meters thick. Winds through the inversion were from the south-southwest and strong (10 m/sec).

Acoustic radar records indicated an inversion persisted throughout the 8th and 9th. On the 9th the inversion lifted more than 80 meters from the surface beginning about 1130 MST. It touched back down at 1500 MST and remained surface based until 1130 MST on the 10th. Neutral conditions then characterized the surface until 1800 MST when an inversion was again formed. This inversion continued into the 11th. During this entire case study the inversion height seldom exceeded 300 meters and was generally 200 meters effective. For the most part, this persistent inversion was characterized by large scale turbulence within. The average wind speed for the forty-eight hour period at the Highway Junction Site was 7.5 m/sec. It is notable that even under such turbulent conditions the inversion remained structured. However, it was not effective enough to shield the surface from pollutants forced down by the vertical wind sheer. The average C-Hill wind speed for this period was 10.0 m/sec.

As mentioned earlier, the winds were exceptionally persistent and strong. Winds at the Highway Junction Site deviated only 10 degrees (220 to 230) on the 9th and 15 degrees (210-225) on the 10th. These are hourly averages. Winds were directionally persistent at all sites. The forty-eight hour directional average at the Lincoln School Site was 210 degrees. Directional averages at the C-Hill site ranged from 171 to 223 degrees over the case study. Due to these conditions, dispersion of smelter emissions was confined in the horizontal to points northeast of the smelter. This was exemplified by an $SO_2$ monitor located approximately 1.5 miles to east of the Highway Junction site which recorded $SO_2$ levels in only thirteen hours of the forty-eight. The Weather Hill Site recorded wind directions ranging from 242 to 251 degrees. Smelter operation shutdown and subsequent startup is clearly reflected in the $SO_2$ values recorded at the Highway Junction Site. The last converter blow and acid plant shutdown was achieved by 0030 MST on the 10th. The 0200 MST hourly average $SO_2$ concentration was near zero. It remained at this zero level until the 1100 hour block on the 10th. Smelter operations were resumed at 1100 MST on the 10th when $SO_2$ was again emitted.

The relationship between local meteorological conditions and the pollution episode experienced at the Highway Junction Site is rather simple. Non-deviating, extremely persistent winds dispersed the pollutants continuously in the direction of the Highway Junction Site and strong vertical sheer forced them to the surface. Factors governing these local meteorological conditions are more complex. The meteorological conditions appear to be a combination of two entities: (1) the mean stationary locations of opposite pressure systems creating the winds, and (2) the influence of topography upon these winds.

## Spring Case Study (Mill Creek and Highway Junction Sites)

Due to curtailment of smelter operations in April 1979, the spring case study was selected from the month of March 1979. In order to present a case study in which a pollution potential was persistent, data from two sites were used. The two sites were Mill Creek and Highway Junction. Further discussion will show that various factors responsible for pollution episodes at both sites are interrelated.

The first pollution episode in this case study was recorded at the Mill Creek Site between 0700 and 1000 MST on March 6, 1979. This period was followed by high $SO_2$ levels recorded at the Highway Junction Site between 1700 MST on the 6th and 1100 MST on the 7th. During this time the Mill Creek Site recorded near zero $SO_2$ levels. A reversal of these $SO_2$ levels then occurred at 1300 and 2200 MST on the 7th.

On March 5, 1979, the synoptic situation was distinguished by surface high pressure system centered over southern Idaho. By 0500 MST on the 6th the pressure center had expanded to include the southwest corner of Montana. The flow about the high influenced westerly winds near the surface (cross-isobaric). Surface charts for 0500 MST on the 7th indicated movement of the high pressure area, by then centered over northern Utah. The flow in effect created southerly surface flow into southern Montana to the west of the Continental Divide during the early hours of the 7th. The same chart also indicated a Pacific cold front stretching from central Alberta to central California and advancing rapidly. Frontal passage occurred about 1300 MST on the 7th. This was supported by Butte FAA data and acoustic radar records. Wind following the frontal passage winds were westerly. The 500 mb charts were also supportive of the surface synoptic situation.

Acoustic radar records indicated an inversion formed on the 5th at 1130 MST and persisted throughout the entire day of the 7th. Throughout this period the inversion was weak and experienced strong winds within. At 0845 MST on the 7th shower activity brought cool air to the surface which maintained the inversion conditions until the frontal passage at 1245 MST. The front was weak yet turbulent. Therefore, the inversion conditions were destroyed by 1500 MST on the 7th, and neutral conditions existed at the surface until 1800 MST. A very weak radiation inversion then formed (50 meters thick) and persisted into the 8th of March.

Upper air information gathered at 0740 MST on the 6th indicated westerly to northwesterly winds from the surface to 1500 meters AGL. A strong surface based inversion was recorded but was only 100 meters thick. The mixing height was about 95 meters but had a very high average wind speed (9.6 m/sec).

A pibal release and sounding that afternoon exhibited very nearly the same characteristics as in the morning. The main exception was the greater mixing height (390 meters).

The next sounding and pibal release made was at 1350 MST on the 7th, just after the frontal passage. Winds were directly from the west, from the surface to 1000 meters and were relatively strong (6 to 25 m/sec). A weak surface based inversion 83 meters thick was a remnant of the passage. The mixing height was about 532 meters with very strong winds through the mixed layer (16.8 m/sec).

Winds were the key factor for areas of pollution potential in this case study. During this forty-eight hour period winds were generally either westerly or southerly. As a result areas to the north-northeast of the smelter works (represented by the Highway Junction Site) or to the east-southeast (represented by the Mill Creek Site) were the primary receptors of the pollutants. As exemplified by the synoptic situation, winds on the first half of the 6th were westerly. Dispersion of emissions was thus easterly, as indicated by the high $SO_2$ levels recorded at the Mill Creek site, especially between 0700 and 1000 MST. Surface winds recorded at the Highway Junction site during this period were northwesterly with speeds averaging 6.8 m/sec. By 1800 MST winds recorded at both the Highway Junction and C-Hill sites were steady, southwesterly, and moderate. These continued until 1200 MST on the 7th at about which time the frontal passage occurred. Prior to the passage, the southwesterly winds were dispersing the emissons continuously in line with the Highway Junction Site. $SO_2$ levels monitored at this site were quite high for the entire case study. The persistence of the winds was borne out by the fact that virtually no $SO_2$ levels were recorded at any other site in the area. After the frontal passage, winds were once again westerly to northwesterly, as shown by surface wind systems located at the Highway Junction and C-Hill sites and upper air wind computations (at 1400 MST on the 7th). This shift in wind direction shifted the dispersion of emissions. As would be expected, $SO_2$ levels recorded at the Mill Creek Site were again high.

The pollution episodes examined in this case study are a function of winds which in turn are related to the synoptic situation. In regard to winds, the synoptic situation can mandate directional components but final determinants are localized factors (i.e. local meteorology and topography). The winds produced during this case study were moderate and persistent. Briefly, in succession, the change in synoptic patterns created a change in wind directions which in turn created a change in dispersion characteristics. Atmospheric stability was not as much a factor in this case due to the winds creating a somewhat homogeneous turbulent atmospheric structure.

# IV. SUMMARY

A summary of the meteorological data collected in the Anaconda area of the Deer Lodge Valley has been presented. Surface and upper air meteorological data collected over a one-year period is discussed and summary tables are presented in the appendix. Case studies of high sulfur dioxide pollution concentrations at surrounding monitors have been examined. The meteorological factors surrounding the periods of high concentrations were given.

The study has put together a data base of meteorological data for future air quality assessments in the area. Also the case studies will provide useful information in any dispersion modeling validations for the smelter complex.

# REFERENCES

ERT Document No. P-4168, 1978: Ambient Concentrations of Sulfur Dioxide Resulting from the Anaconda Copper Smelter - Technical Appendix. Environmental Research and Technology, Inc., Concord, Massachusetts.

GELHAUS, J. W. et al., 1979b: Montana Air Resources Modeling System, Air Quality Bureau, Montana Department of Health and Environmental Sciences, Helena, Montana.

GELHAUS, J. W. et al., 1979a: Meteorological Study Columbia Falls, Montana. Air Quality Bureau, Montana Department of Health and Environmental Sciences, Helena, Montana.

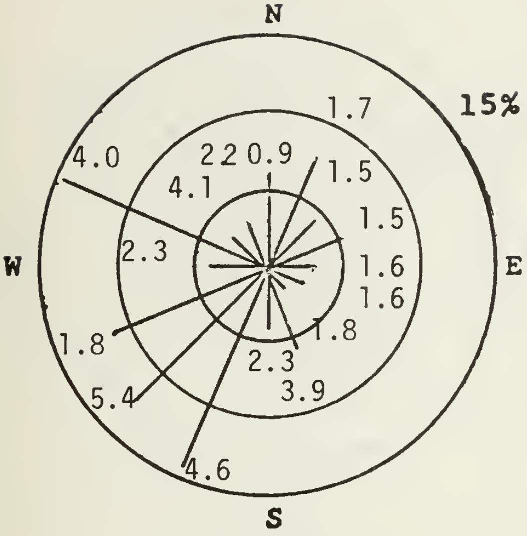
HEIMBACH, J. A., 1977: Diffusion Model Testing for Anaconda Reduction Works, Anaconda, Montana. Department of Earth Sciences, Montana State University, Bozeman, Montana.

HOLZWORTH, G. C., 1974: Climatological Data on Atmospheric Stability in the United States. American Meteorological Society Symposium on Atmospheric Diffusion and Air Pollution.

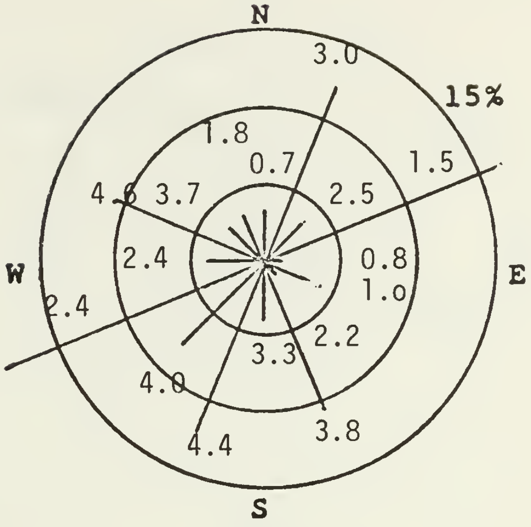
JOHNSON, F. G. et al., 1978: Airborne Measurements of a Copper Smelter Plume in Montana. Environmental Monitoring and Support Laboratory, U. S. Environmental Protection Agency, Las Vegas, Nevada.

SUPER, A. B., et al., 1972: Atmospheric Water Resources Management Program, Final Report Part I. Montana State University, Bozeman, Montana.

# APPENDIX A

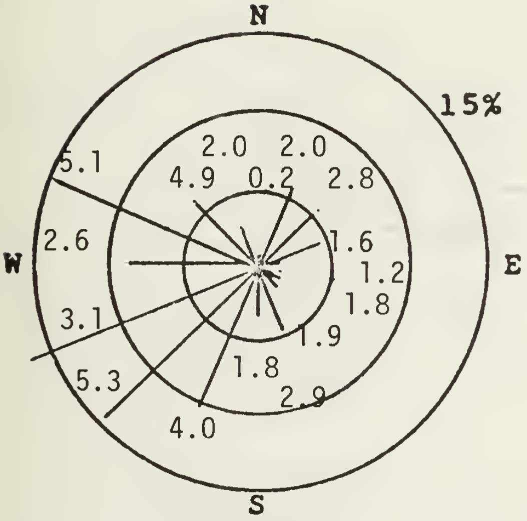


January 1978
Calm 0.3%
Total Hours 675

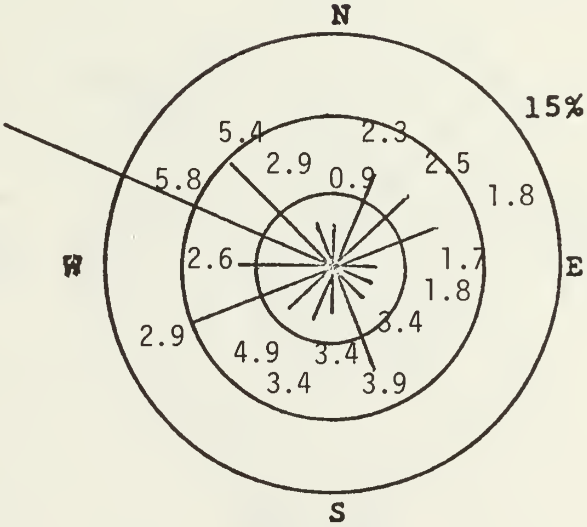


February 1978
Calm 0.3%
Total Hours 654

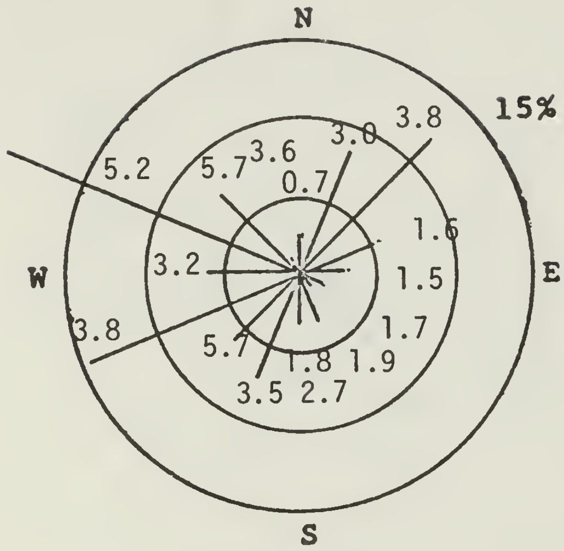
MONTHLY WIND ROSES
Highway Junction Site
Anaconda, MT



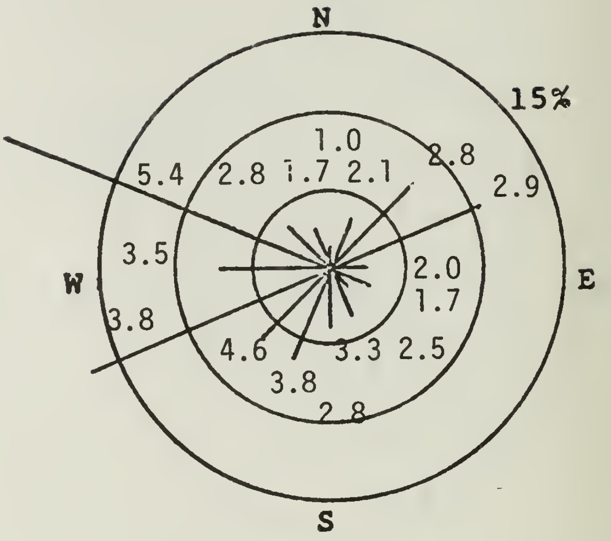
March 1978
Calm 0.1%
Total Hours 712



April 1978
Calm 0.0%
Total Hours 708

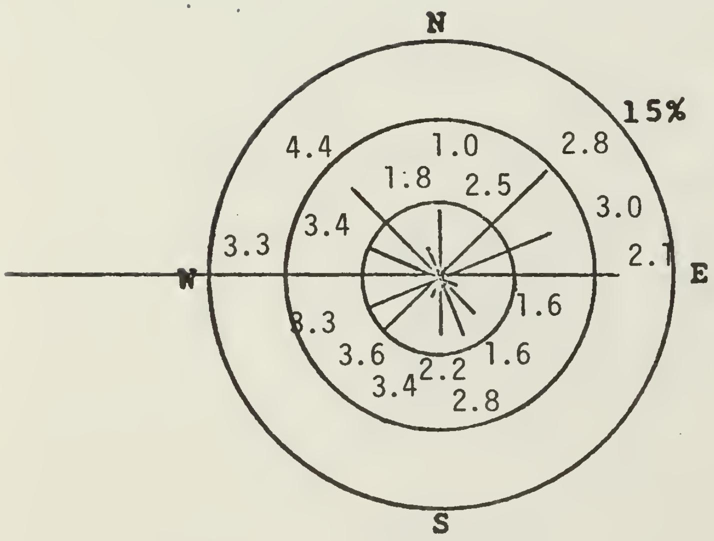


May 1978
Calm 0.0%
Total Hours 644

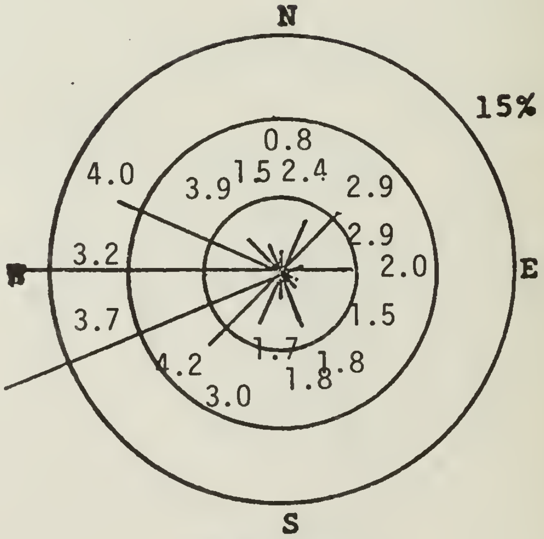


June 1978
Calm 0.0%
Total Hours 669

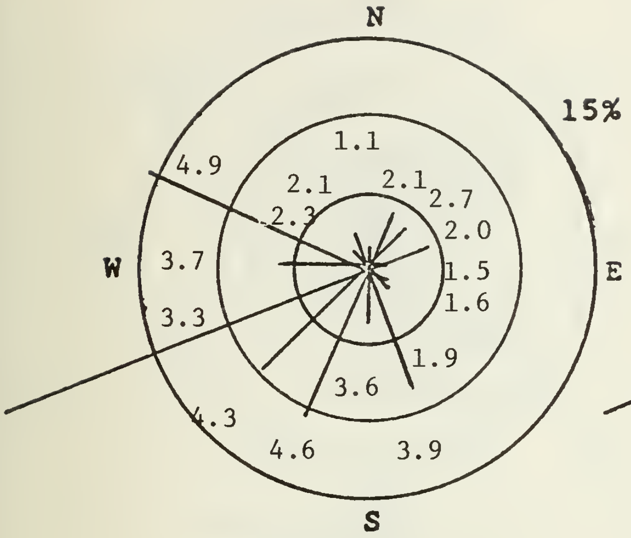
MONTHLY WIND ROSES
Highway Juntion Site
Anaconda, MT



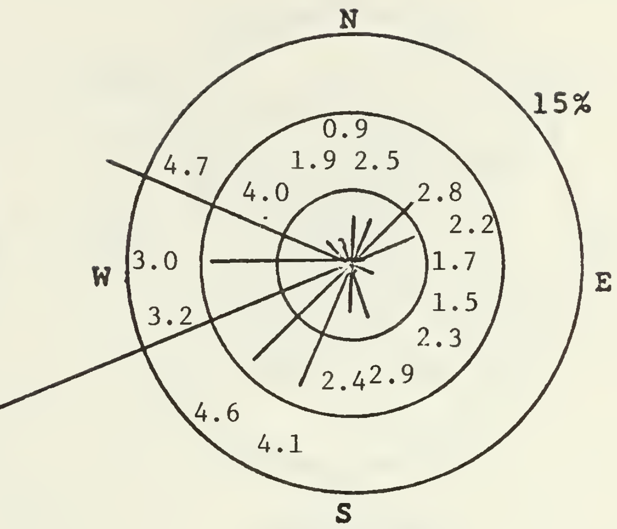
July 1978
Calm 0.0%
Total Hours 722



August 1978
Calm 0.0%
Total Hours 713

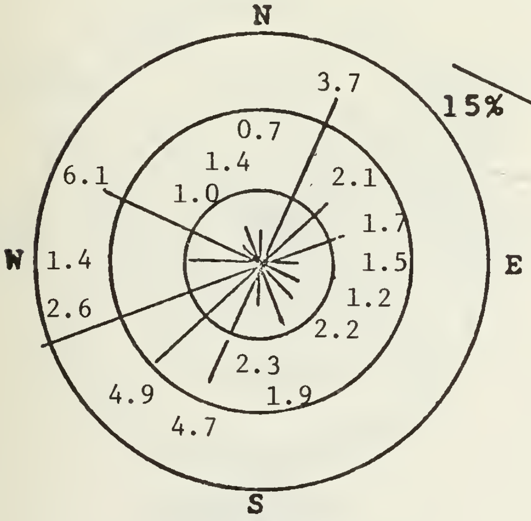


Sept. 1978
Calm 0.0%
Total Hours 701

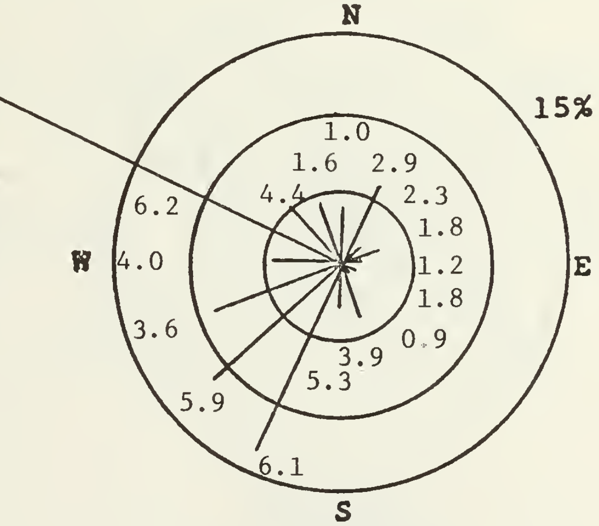


Oct. 1978
Calm 0.0%
Total Hours 708

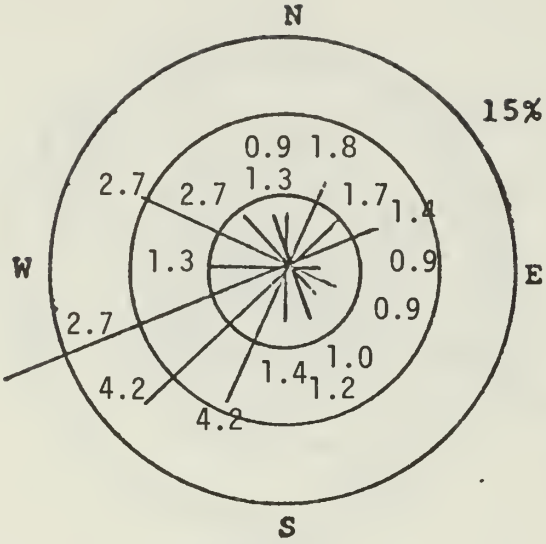
Monthly Wind Roses
Highway Junction Site
Anaconda, Montana



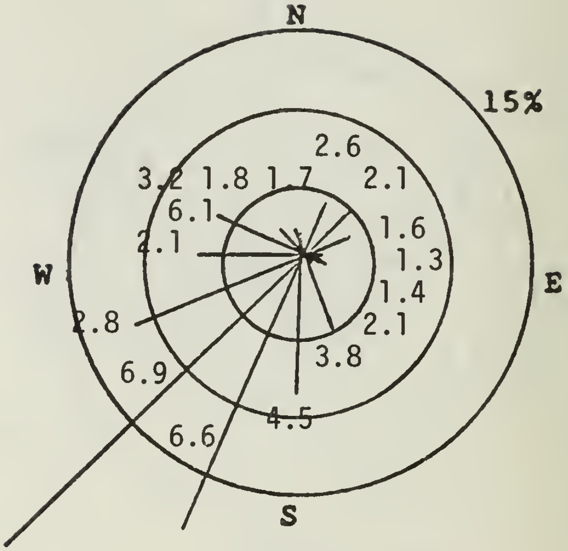
Nov. 1978
Calm 0.3%
Total Hours 692



Dec. 1978
Calm 0.0%
Total Hours 663

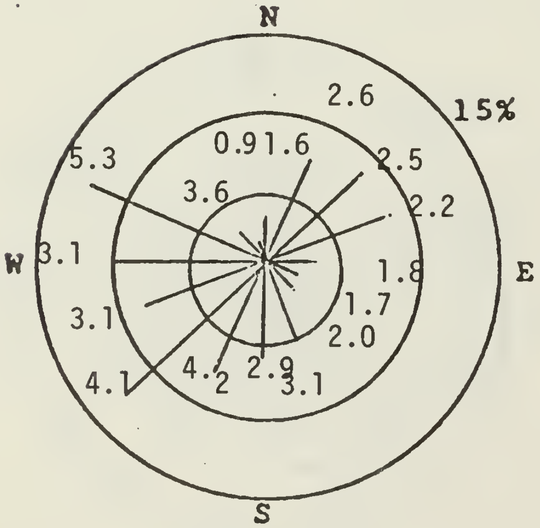


January 1979
Calm 0.0%
Total Hours 555

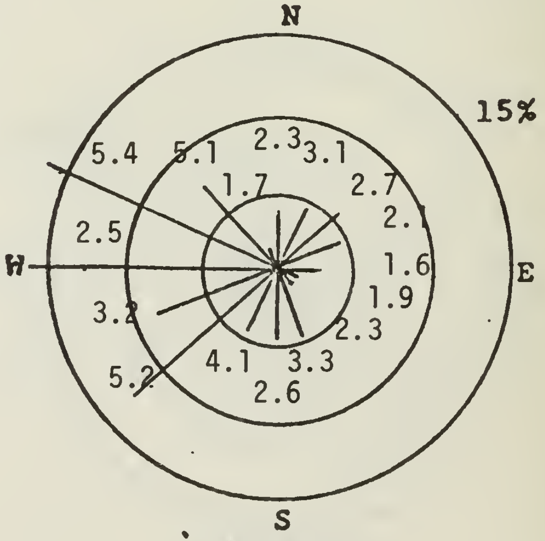


February 1979
Calm 0.2%
Total Hours 618

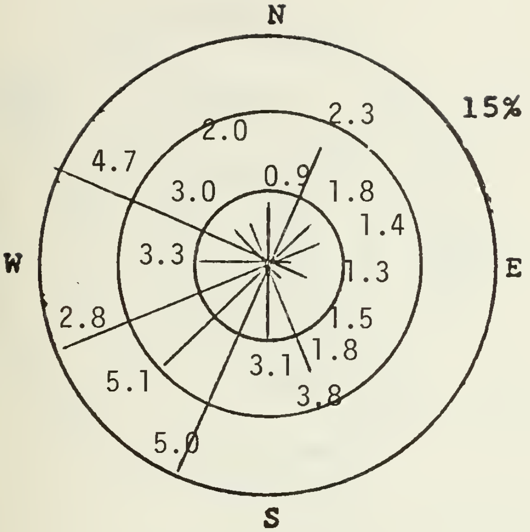
MONTHLY WIND ROSES
Highway Junction Site
Anaconda, MT



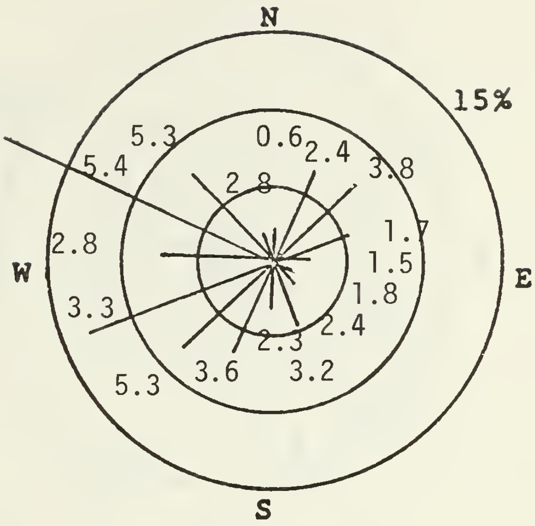
March 1979
Calm 0.0%
Total Hours 732



April 1979
Calm 0.0%
Total Hours 512

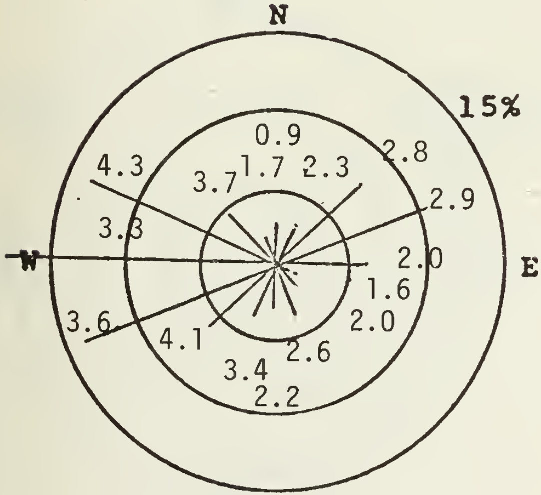


Winter 1977-1978
Calm 0.2%
Total Hours 2045

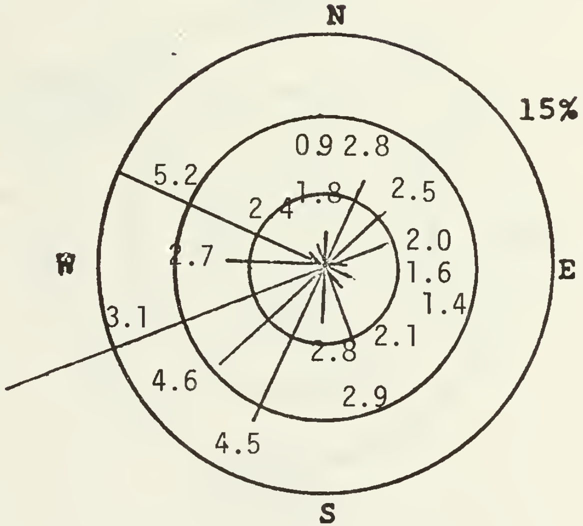


Spring 1978
Calm 0.0%
Total Hours 2064

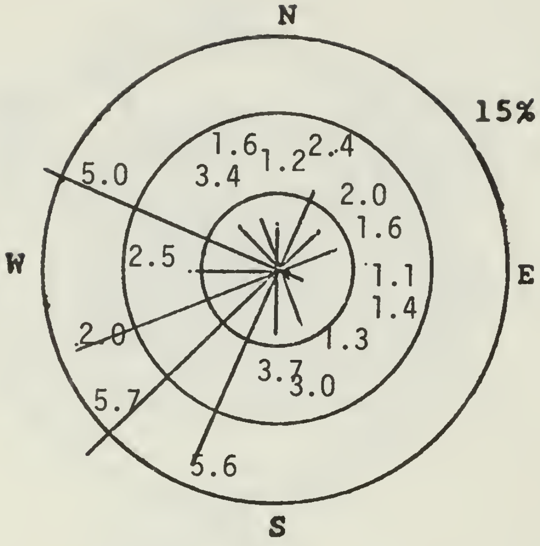
SEASONAL WIND ROSES
Highway Junction Site
Anaconda, MT



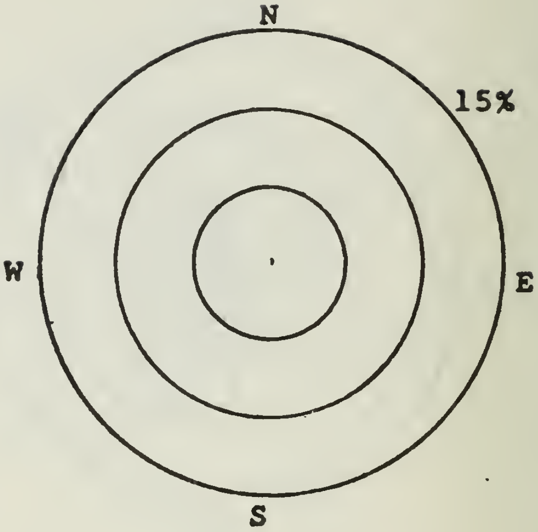
Summer 1978
Calm 0.0%
Total Hours 2104



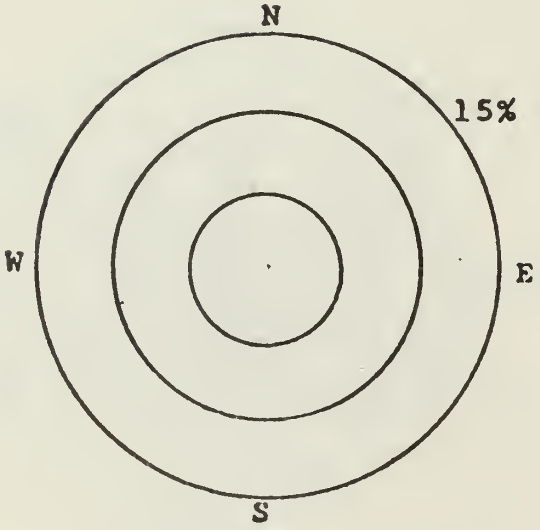
Autumn 1978
Calm 0.1%
Total Hours 2101

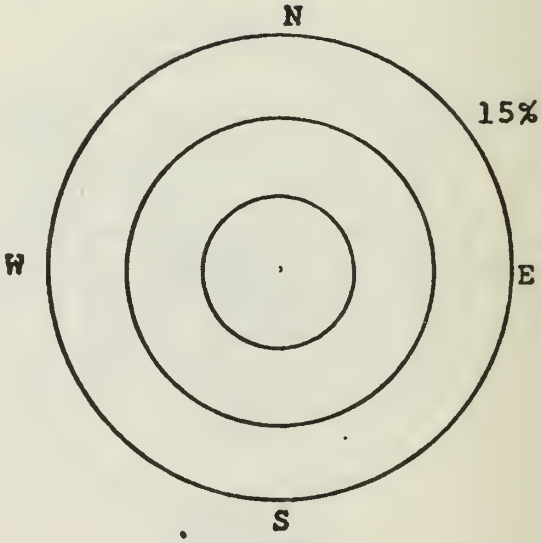


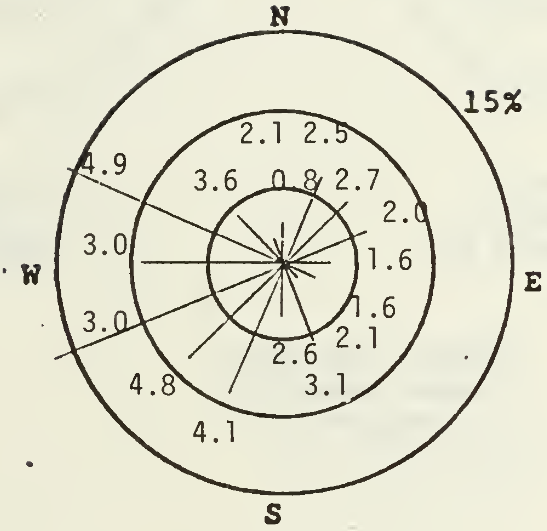
Winter 1978-79
Calm 0.1%
Total Hours 1836



SEASONAL WIND ROSES
Highway Junction
Anaconda, MT

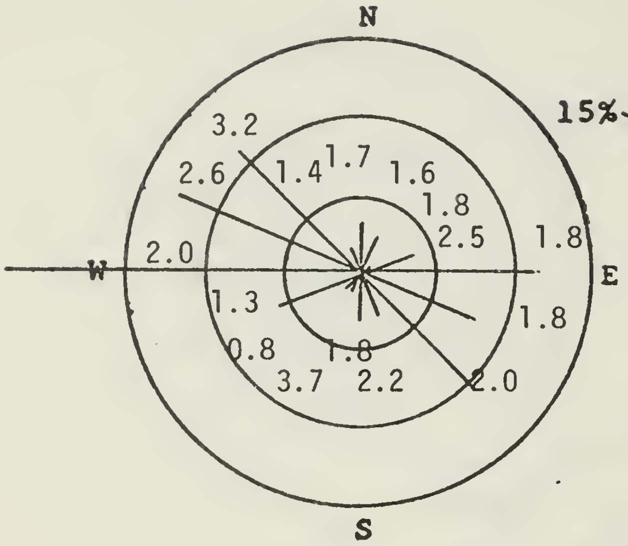




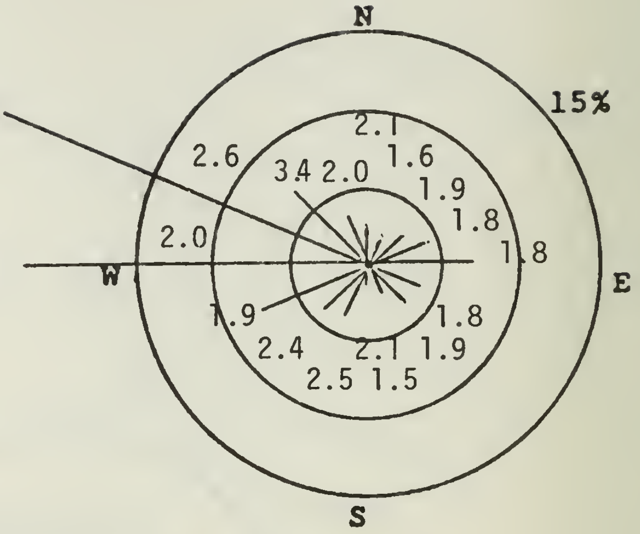


Calm 0.1%
Total Hours 8113

ANNUAL WIND ROSE
Highway Junction Site
Anaconda, MT

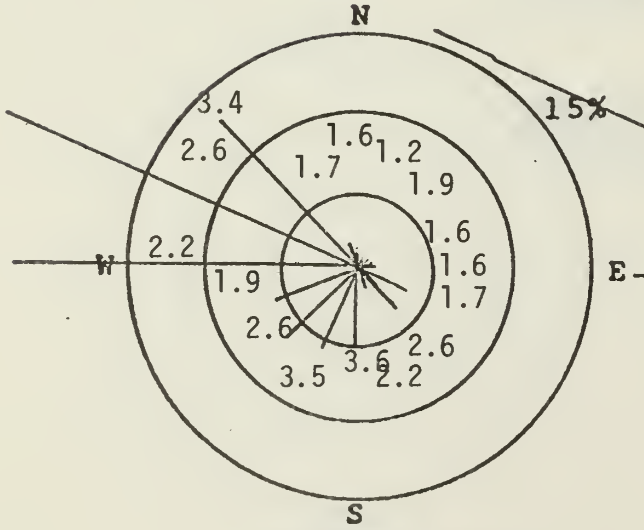


July 1978
Calm 0.0%
Total Hours 407

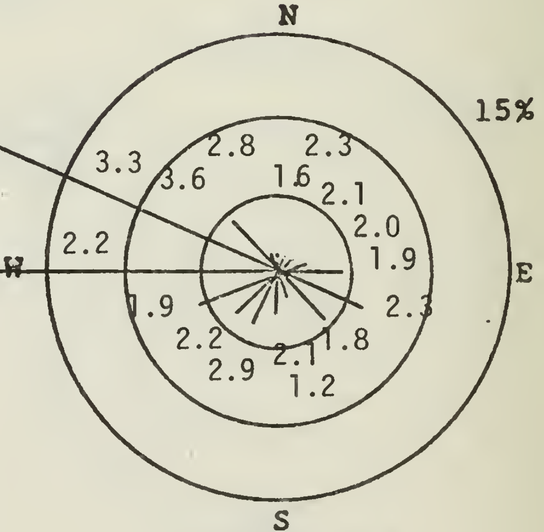


August 1978
Calm 0.0%
Total Hours 720

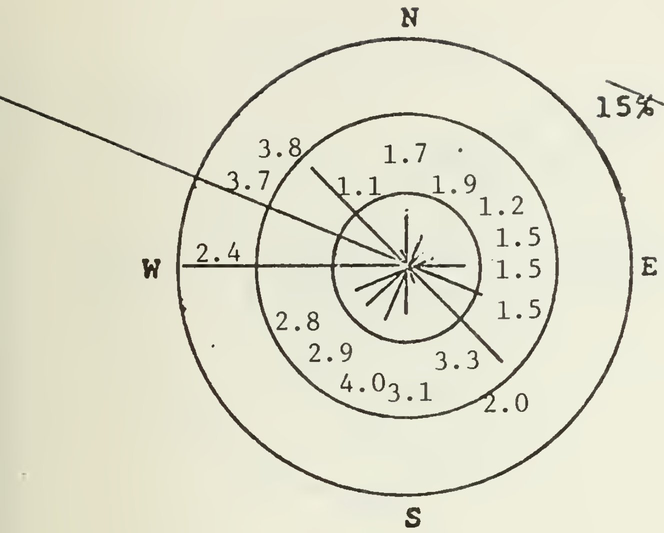
MONTHLY WIND ROSES
Lincoln School Site
Anaconda, MT



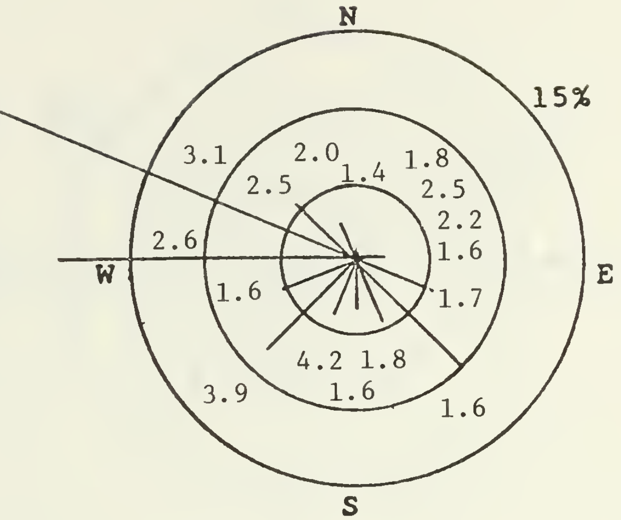
September 1978
Calm 0.0%
Total Hours 708



October 1978
Calm 0.0%
Total Hours 525

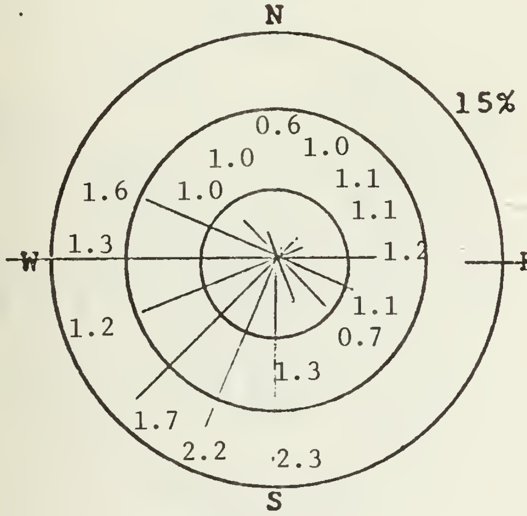


Dec. 1978
Calm 0.0%
Total Hours 360

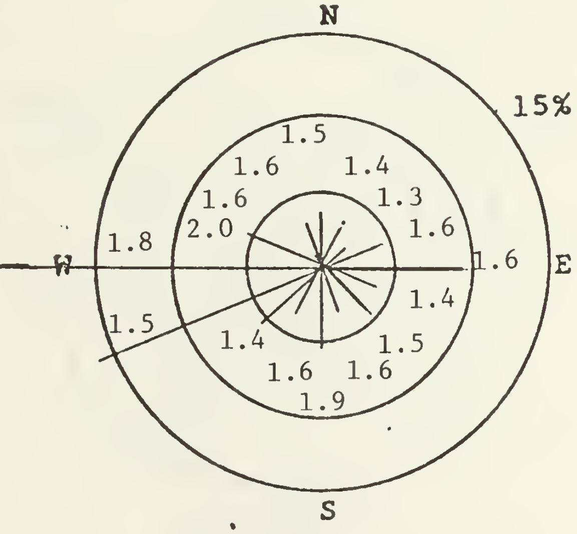


Jan. 1979
Calm 0.0%
Total Hours 345

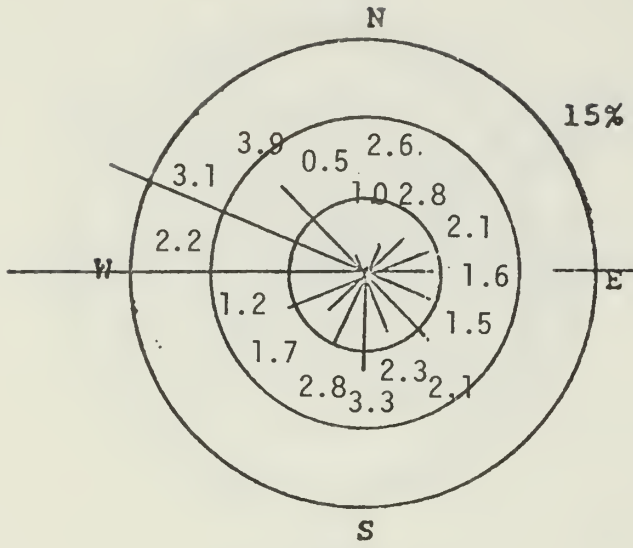
Monthly Wind Roses
Lincon School Site
Anaconda, MT



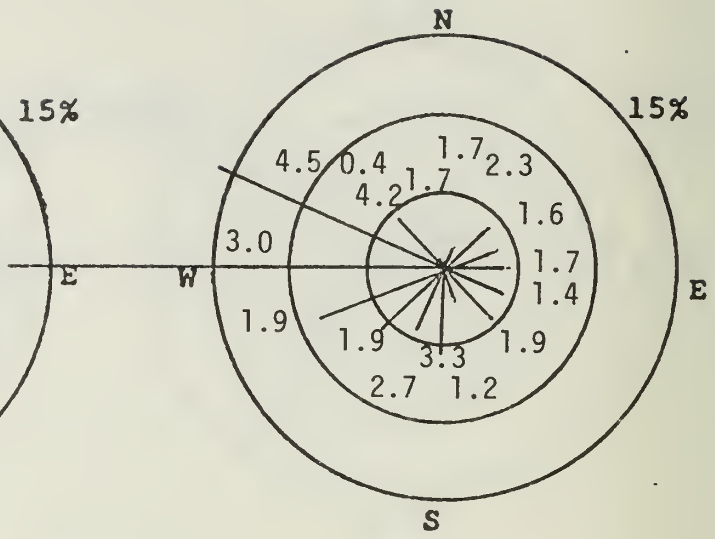
Feb. 1979
Calm 0.0%
Total Hours 646



March 1979
Calm 0.0%
Total Hours 729

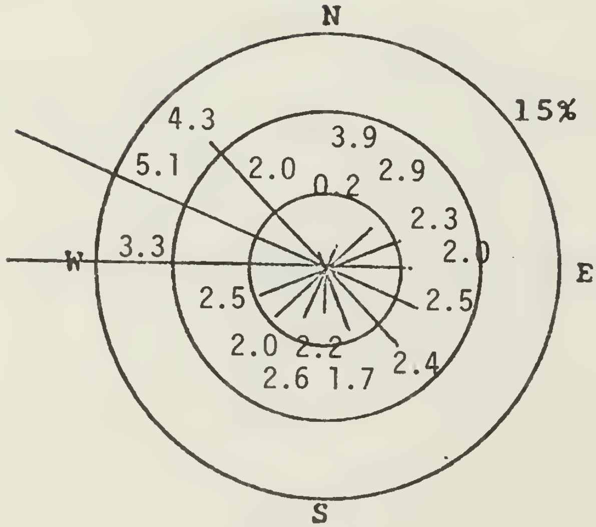


February 1978
Calm 0.8%
Total Hours 643

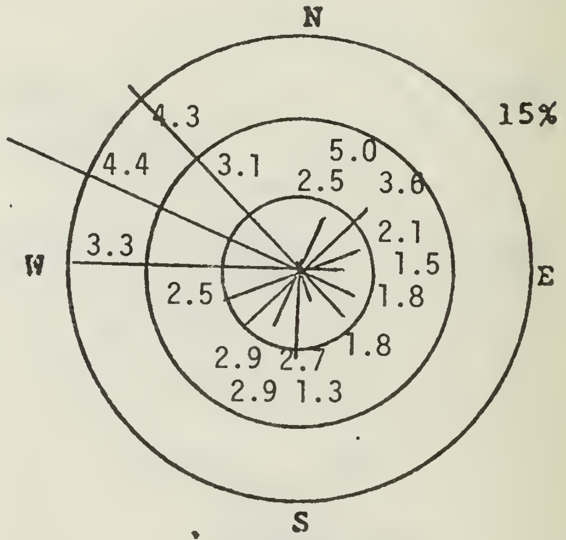


March 1978
Calm 2.7%
Total Hours 695

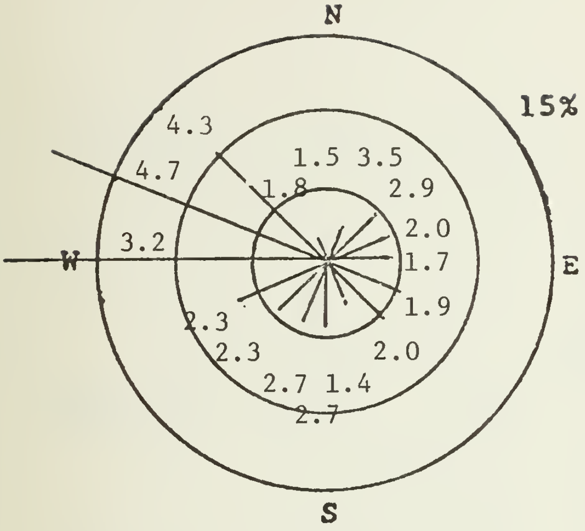
MONTHLY WIND ROSES
Water Office Site
Anaconda, MT



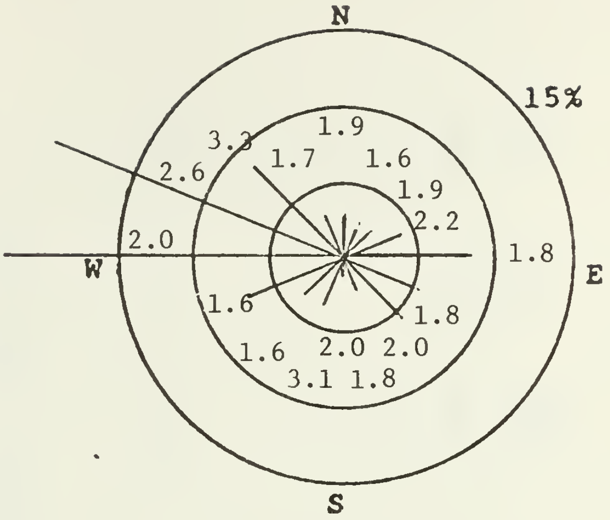
April 1978
Calm 0.4%
Total Hours 704



May 1978
Calm 0.6%
Total Hours 636

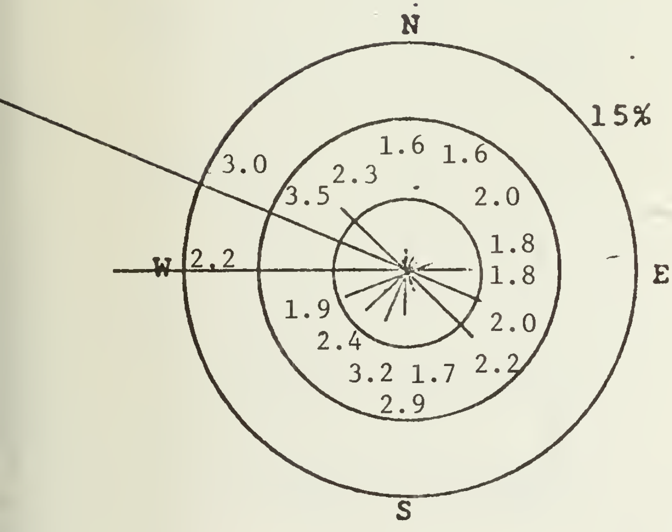


Spring 1978
Water Office Site
Calm 0.0%
Total Hours. 2054

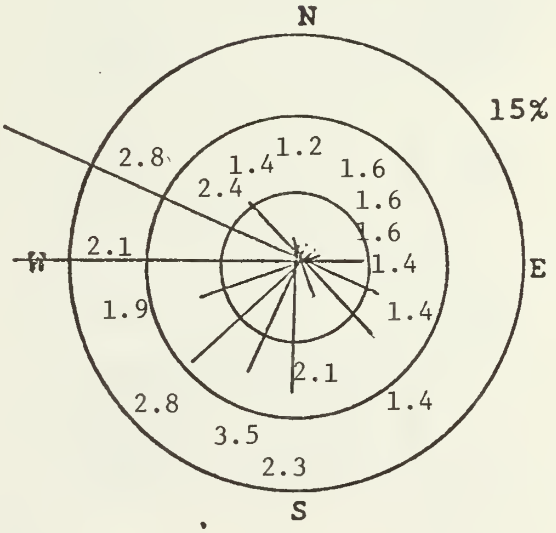


Summer 1978
Lincoln School Site
Calm 0.0%
Total Hours 1127

Seasonal Wind Roses
Anaconda, Montana



Autumn 1978
Lincoln School Site
Calm 0.1%
Total Hours 1233



Winter 1978-1979
Lincoln School Site
Calm 0.0%
Total Hours 1351

INVERSION STUDY - % FREQUENCY OF OCCURRENCE
SITE _ ANACONDA - HIGHWAY JUNCTION

DATE/TIME Autumn 1978
a.m.

INVERSION BASE HEIGHT (m)

| THICKNESS (m) | SFC | 1-100 | 101-250 | 251-500 | 501-750 | 751-1000 | 1001-1500 | 1501-2000 | 2000 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1-100 | 8.0 | 1.4 | 5.8 | 3.6 | 5.8 | 2.9 | 8.0 | 8.0 | 0.7 | 44.2 |
| 101-250 | 14.5 |  | 1.4 | 7.2 | 2.2 | 2.2 | 6.5 | 5.8 |  | 39.8 |
| 251-500 | 2.2 |  | 0.7 | 4.3 | 1.4 | 0.7 | 1.4 | 2.2 |  | 12.9 |
| 501-750 |  | 0.7 |  |  | 0.7 |  |  |  |  | 1.4 |
| >750 | 0.7 |  |  |  |  |  |  |  |  | 0.7 |
| TOTAL | 25.4 | 2.1 | 7.9 | 15.1 | 10.1 | 5.8 | 15.9 | 16.0 | 0.7 | 99.0 |
| NO INVERSIONS |  |  |  |  |  |  |  |  |  | 1.4 |

DATE/TIME Autumn 1978
p.m.

|  |  |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|
| 1-100 | 1.6 |  | 3.1 | 9.4 | 11.1 | 1.6 | 18.8 | 4.7 | 1.6 | 51.9 |
| 101-250 |  | 1.6 | 3.1 | 4.7 | 4.7 | 3.1 | 4.7 | 11.1 |  | 33.0 |
| 251-500 |  |  | 1.6 | 1.6 |  | 1.6 | 1.6 |  |  | 6.4 |
| 501-750 |  |  |  |  |  |  |  |  |  |  |
| >750 |  |  |  |  |  |  |  |  |  |  |
| TOTAL | 1.6 | 1.6 | 7.8 | 15.7 | 15.8 | 6.3 | 25.1 | 15.8 | 1.6 | 91.3 |
| NO INVERSIONS |  |  |  |  |  |  |  |  |  | 9.4 |

% FREQUENCY OF OCCURRENCE

SITE _ Anaconda - Highway Junction

DATE/TIME Winter 1978 a.m.

INVERSION BASE HEIGHT (m)

| THICKNESS (m) | SFC | 1-100 | 101-250 | 251-500 | 501-750 | 751-1000 | 1001-1500 | 1501-2000 | 2000 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1-100 | 8.9 | 2.7 | 2.7 | 7.5 | 7.5 | 6.2 | 6.2 | 4.8 |  | 46.5 |
| 101-250 | 9.6 | 0.7 | 2.7 | 7.5 | 2.1 | 2.7 | 7.5 | 3.4 | 0.7 | 36.9 |
| 251-500 | 3.4 | 0.7 | 1.4 | 3.4 | 1.4 | 0.7 | 2.7 | 1.4 |  | 15.1 |
| 501-750 |  | 0.7 |  |  |  |  |  |  |  | 0.7 |
| 750 |  |  |  |  |  |  |  |  |  |  |
| TOTAL | 21.9 | 4.8 | 6.8 | 18.4 | 11.0 | 9.6 | 16.4 | 9.6 | 0.7 | 99.2 |
| NO INVERSIONS |  |  |  |  |  |  |  |  |  | 0.7 |

DATE/TIME Winter 1978-79
p.m.

| THICKNESS (m) | SFC | 1-100 | 101-250 | 251-500 | 501-750 | 751-1000 | 1001-1500 | 1501-2000 | 2000 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1-100 | 4.8 |  | 5.8 | 8.7 | 4.8 | 4.8 | 5.8 | 6.7 | 1.0 | 42.4 |
| 101-250 | 1.0 | 3.8 | 7.7 | 13.5 | 7.7 | 1.0 | 4.8 | 5.8 |  | 45.3 |
| 251-500 |  |  | 1.9 |  |  | 1.9 | 2.9 | 1.0 | 1.0 | 8.7 |
| 501-750 |  |  |  |  |  |  |  |  |  |  |
| 750 |  |  |  |  |  |  |  |  |  |  |
| TOTAL | 5.8 | 3.8 | 15.4 | 22.2 | 12.5 | 7.7 | 13.5 | 13.5 | 2.0 | 96.4 |
| NO INVERSIONS |  |  |  |  |  |  |  |  |  | 3.8 |

INVERSION STUDY - FREQUENCY OF OCCURRENCE HOLZWORTH CLASSIFICATION

SITE HIGHWAY JUNCTION

DATE/TIME Autumn 1978
a.m.

INVERSION BASE HEIGHT (m)

| HOLZ. INV. TYPE | SFC | 1-100 | 101-250 | 251-500 | 501-750 | 751-1000 | 1001-1500 | 1501-2000 | >2000 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.5 | 1.5 | 1.5 | 4.4 | 5.9 | 3.7 | 8.8 | 10.3 | 0.7 | 38.3 |
| 2 | 5.1 |  | 4.4 | 5.9 | 2.2 | 2.2 | 6.6 | 5.1 |  | 31.5 |
| 3 | 12.5 | 0.7 | 2.2 | 4.4 | 1.5 |  | 0.7 | 0.7 |  | 22.7 |
| 4 | 5.8 |  |  |  | 0.7 |  |  |  |  | 6.5 |
| 5 | 0.7 |  |  |  |  |  |  |  |  | 0.7 |
| TOTAL | 25.6 | 2.2 | 8.1 | 14.7 | 10.3 | 5.9 | 16.1 | 16.1 | 0.7 | 99.7 |

DATE/TIME Autumn 1978
p.m.

|  |  |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 |  |  | 3.4 | 10.3 | 13.8 | 5.2 | 13.8 | 8.6 | 1.7 | 56.8 |
| 2 |  | 1.7 | 1.7 | 5.2 |  | 1.7 | 13.8 | 8.6 |  | 32.7 |
| 3 | 1.7 |  | 3.4 | 1.7 | 3.4 |  |  |  |  | 10.2 |
| 4 |  |  |  |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |  |  |  |
| TOTAL | 1.7 | 1.7 | 8.5 | 17.2 | 17.2 | 6.9 | 27.6 | 17.2 | 1.7 | 99.7 |

INVERSION STUDY - FREQUENCY OF OCCURRENCE HOLZWORTH CLASSIFICATION

SITE HIGHWAY JUNCTION

DATE/TIME Winter 1978-79
a.m.

INVERSION BASE HEIGHT (m)

| HOLZ. INV. TYPE | SFC | 1-100 | 101-250 | 251-500 | 501-750 | 751-1000 | 1001-1500 | 1501-2000 | >2000 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.4 | 2.8 | 2.1 | 6.2 | 4.8 | 2.8 | 12.4 | 4.8 | | 37.3 |
| 2 | 4.8 | 0.7 | 2.8 | 9.0 | 2.8 | 5.5 | 3.4 | 3.4 | 0.7 | 33.1 |
| 3 | 11.0 | 1.4 | 2.1 | 2.8 | 3.4 | 1.4 | 0.7 | 1.4 | | 24.2 |
| 4 | 4.1 | | | 0.7 | | | | | | 4.8 |
| 5 | 0.7 | | | | | | | | | |
| TOTAL | 22.0 | 4.9 | 7.0 | 18.7 | 11.0 | 9.7 | 16.5 | 9.6 | 0.7 | 100.1 |

DATE/TIME Winter 1978-79
p.m.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.0 | | 6.0 | 9.0 | 7.0 | 3.0 | 5.0 | 6.0 | 1.0 | 38.0 |
| 2 | 4.0 | 1.0 | 3.0 | 9.0 | 4.0 | 4.0 | 8.0 | 8.0 | 1.0 | 42.0 |
| 3 | 1.0 | 1.0 | 7.0 | 5.0 | 2.0 | 1.0 | 3.0 | | | 20.0 |
| 4 | | | | | | | | | | |
| 5 | | | | | | | | | | |
| TOTAL | 6.0 | 2.0 | 16.0 | 23.0 | 13.0 | 8.0 | 16.0 | 14.0 | 2.0 | 100.0 |

## ANACONDA - HIGHWAY JUNCTION

### MIXING HEIGHTS - NUMBER OF OCCURRENCES
Morning 1978-79

| HEIGHT(m) | JUN | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | SUM | AUT | WIN | SPG | ANNUAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-100 | | | 6 | 4 | 12 | 4 | 4 | 8 | 4 | 5 | 3 | | | 20 | 16 | | |
| 101-250 | | | 1 | 1 | 3 | 4 | 5 | 5 | 4 | 4 | 4 | | | 8 | 14 | | |
| 251-500 | | | 1 | 3 | 1 | | 4 | 3 | 4 | 1 | | | | 4 | 11 | | |
| 501-750 | | | 2 | 3 | 1 | 1 | 1 | | 1 | 1 | 5 | | | 5 | 2 | | |
| 751-1000 | | | | | | 1 | 2 | | | 2 | | | | 1 | 2 | | |
| 1001-1500 | | | 1 | 1 | | 4 | 2 | | | 2 | | | | 5 | 2 | | |
| >1500 | | | | | 1 | | | | | 1 | | | | 1 | | | |
| Total | | | 11 | 12 | 18 | 14 | 18 | 16 | 13 | 16 | 12 | | | 44 | 47 | | |

### MIXING HEIGHTS - PERCENT OCCURRENCE
MORNING

| HEIGHT(m) | JUN | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | SUM | AUT | WIN | SPG | ANNUAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-100 | | | 54.5 | 33.3 | 66.7 | 28.6 | 22.2 | 50.0 | 30.8 | 31.3 | 25.0 | | | 45.5 | 34.0 | | |
| 101-250 | | | 9.1 | 8.3 | 16.7 | 28.6 | 27.8 | 31.3 | 30.8 | 25.0 | 33.3 | | | 18.2 | 29.8 | | |
| 251-500 | | | 9.1 | 25.0 | 5.6 | | 22.2 | 18.8 | 30.8 | 6.3 | | | | 9.1 | 23.4 | | |
| 501-750 | | | 18.2 | 25.0 | 5.6 | 7.1 | 5.6 | | 7.7 | 6.3 | 41.2 | | | 11.4 | 4.3 | | |
| 751-1000 | | | | | | 7.1 | 11.1 | | | 12.5 | | | | 2.3 | 4.3 | | |
| 1001-1500 | | | 9.1 | 8.3 | | 28.6 | 11.1 | | | 12.5 | | | | 11.4 | 4.3 | | |
| >1500 | | | | | 5.6 | | | | | 6.3 | | | | 2.3 | | | |
| AVERAGE WIND SPEED THROUGH MIXED LAYER (m/sec) | | | | | | | | | | | | | | | | | |
| | | | 4.3 | 4.7 | 6.6 | 5.0 | 7.7 | 2.5 | 4.3 | 4.7 | 4.9 | | | 5.4 | 4.8 | | |

## MIXING HEIGHTS - NUMBER OF OCCURRENCES
## AFTERNOONS

| HEIGHT(m) | JUN | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | SUM | AUT | WIN | SPG | ANNUAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-100 | | | | | | 1 | 1 | 1 | | 1 | | | | | 2 | | |
| 101-250 | | | | | | | | 3 | 2 | 1 | | | | | 5 | | |
| 251-500 | | | 3 | 1 | 1 | 3 | 7 | 10 | 1 | 3 | | | | 5 | 18 | | |
| 501-750 | | | 2 | 3 | 1 | 1 | | 3 | 3 | 2 | 5 | | | 5 | 6 | | |
| 751-1000 | | | 1 | 2 | 1 | | | 1 | | | 2 | | | 4 | 1 | | |
| 1001-1500 | | | | 1 | 7 | 1 | 1 | | | 2 | 1 | | | 9 | 1 | | |
| >1500 | | | 4 | 4 | 4 | 1 | 3 | | 2 | 6 | 6 | | | 9 | 5 | | |
| Total | | | 10 | 11 | 14 | 7 | 12 | 18 | 8 | 15 | 14 | | | 32 | 38 | | |

## MIXING HEIGHTS - PERCENT OCCURRENCE

| HEIGHT(m) | JUN | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | SUM | AUT | WIN | SPG | ANNUAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0-100 | | | | | | 14.3 | 8.3 | 5.6 | | 6.7 | | | | | 5.3 | | |
| 101-250 | | | | | | | | 16.7 | 25.0 | 6.7 | | | | | 13.2 | | |
| 251-500 | | | 30.0 | 9.1 | 7.1 | 42.9 | 58.3 | 55.6 | 12.5 | 20.0 | | | | 15.6 | 4.7 | | |
| 501-750 | | | 20.0 | 27.3 | 7.1 | 14.3 | | 16.7 | 37.5 | 13.3 | 35.7 | | | 15.6 | 15.8 | | |
| 751-1000 | | | 10.0 | 18.2 | 7.1 | | | 5.6 | | | 14.3 | | | 12.5 | 2.6 | | |
| 1001-1500 | | | | 9.1 | 50.0 | 14.3 | 8.3 | | | 13.3 | 7.1 | | | 28.1 | 2.6 | | |
| >1500 | | | 40.0 | 36.4 | 28.6 | 14.3 | 25.0 | | 25.0 | 40.0 | 42.9 | | | 28.1 | 13.2 | | |
| AVERAGE WIND SPEED THROUGH MIXED LAYER (m/sec) | | | 6.7 | 7.9 | 7.2 | 4.2 | 7.3 | 3.5 | 6.4 | 6.9 | 7.9 | | | 6.4 | 5.7 | | |

SITE - ANACONDA - HIGHWAY JUNCTION

AVERAGE LAPSE RATE IN FIRST INVERSION (C/100m) - MORNING

| JUN | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | SUM | AUT | WIN | SPG | ANNUAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  | 2.1 | 1.3 | 2.4 | 1.5 | 1.5 | 1.7 | 2.1 | 1.4 | 1.5 |  |  | 1.7 | 1.8 |  |  |

AVERAGE LAPSE RATE BELOW FIRST INVERSION (C)-MORNING

| JUN | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | SUM | AUT | WIN | SPG | ANNUAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  | -0.6 | -0.5 | -1.0 | -2.7 | -0.8 | -2.0 | -1.6 | -0.7 | -0.7 |  |  | -1.4 | -1.5 |  |  |

PERCENT FREQUENCY OF SURFACE BASED FIRST INVERSIONS - MORNING

| JUN | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | SUM | AUT | WIN | SPG | ANNUAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  | 88.0 | 81.8 | 94.4 | 69.2 | 72.2 | 62.5 | 75.0 | 69.0 | 66.6 |  |  | 60.0 | 52.2 |  |  |

AVERAGE LAPSE RATE IN FIRST INVERSION (C/100m) - AFTERNOON

| JUN | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | SUM | AUT | WIN | SPG | ANNUAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  | 0.5 | 0.5 | 0.5 | 1.2 | 0.9 | 1.3 | 0.4 | 1.1 | 0.5 |  |  | 0.7 | 0.9 |  |  |

AVERAGE LAPSE RATE BELOW FIRST INVERSION (C) - AFTERNOON

| JUN | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | SUM | AUT | WIN | SPG | ANNUAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  | -1.2 | -1.2 | -1.7 | -3.1 | -1.2 | -1.7 | -1.0 | -1.2 | -1.0 |  |  | -2.0 | -1.3 |  |  |

PERCENT FREQUENCY OF SURFACE BASED FIRST INVERSIONS - AFTERNOON

| JUN | JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | SUM | AUT | WIN | SPG | ANNUAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  | 0.0 | 0.0 | 0.0 | 16.7 | 27.3 | 11.1 | 20.0 | 30.0 | 0.0 |  |  | 3.8 | 17.6 |  |  |

LAPSE RATE COMPARISON VALUES (1978-79)
SITE - ANACONDA - HIGHWAY JUNCTION

| | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR* | MAY | JUN | JUL | SUM | AUT | WIN | SPG | ANNUAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LR(A) | 0.2 | 0.6 | 2.6 | -0.2 | -1.5 | 3.4 | 1.0 | -0.6 | -1.5 | | | | | 0.6 | 1.0 | | |
| LR(AA) | 0.5 | -0.5 | 1.8 | 0.9 | -1.0 | 3.2 | 0.2 | -0.7 | | | | | | 0.7 | 0.8 | | |
| LR(B) | -6.8 | -7.1 | -9.5 | -7.4 | -4.3 | -1.4 | -4.0 | -5.4 | -6.5 | | | | | -8.2 | -3.2 | | |
| LR(BB) | -6.2 | -6.8 | -5.4 | -3.2 | -4.1 | -0.3 | -3.6 | -5.0 | | | | | | -5.1 | -2.7 | | |
| T(1) | 8.8 | 8.6 | 2.6 | -7.0 | -8.0 | -14.0 | -7.3 | -0.1 | -1.4 | | | | | 1.4 | -9.8 | | |
| T(2) | 23.9 | 18.1 | 14.9 | -1.1 | -2.1 | -0.5 | -0.3 | 7.6 | 5.9 | | | | | 10.6 | -3.4 | | |
| T(3) | 9.0 | 8.0 | 5.2 | -7.2 | -9.5 | -10.6 | -6.3 | -0.7 | -2.9 | | | | | 2.0 | -8.8 | | |
| T(4) | 9.3 | 8.1 | 4.4 | -6.1 | -9.0 | -10.8 | -7.1 | -0.8 | | | | | | 2.1 | -9.0 | | |
| T(5) | 17.1 | 11.0 | 5.4 | -8.5 | -6.4 | -10.9 | -4.3 | 2.2 | -0.6 | | | | | 2.3 | -7.1 | | |
| T(6) | 17.7 | 11.3 | 9.5 | -4.3 | -6.2 | -9.8 | -3.9 | 2.6 | | | | | | 5.5 | -6.6 | | |

LR(A) - a.m. lapse rate (from temperature sounding) $^{o}$C/661 m
LR(AA) - a.m. lapse rate (instrument - C-Hill) $^{o}$C/661 m
LR(B) - p.m. lapse rate (from temperature sounding) $^{o}$C/661 m
LR(BB) - p.m. lapse rate (instrument - C-Hill) $^{o}$C/661 m

T(1) - a.m. surface temperature $^{o}$C
T(2) - p.m. surface temperature $^{o}$C
T(3) - a.m. temperature (from temperature sounding) $^{o}$C at 661 m
T(4) - a.m. temperature (instrument - C-Hill) $^{o}$C at 661 m
T(5) - p.m. temperature (from temperature sounding) $^{o}$C at 661 m
T(6) - p.m. temperature (instrument - C-Hill) $^{o}$C at 661 m

a.m. release time - one half hour after sunrise
p.m. release time - 1400 MST

*ACM computer down, data collected is not representative of month

## ACOUSTIC RADAR ANALYSIS

DEER LODGE VALLEY DISPERSION STUDY MONTH OF MAY 1978

### ********************** FIRST INVERSION **********************

| DAY | 0000-0600 MST BASE (100M) | TOP (100M) | TYPE * | 0601-1200 MST BASE (100M) | TOP (100M) | TYPE * | 1201-1800 MST BASE (100M) | TOP (100M) | TYPE * | 1801-2400 MST BASE (100M) | TOP (100M) | TYPE * |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | M | M | M | M | M | M | M | M | M | M | M | M |
| 2 | M | M | M | M | M | M | M | M | M | M | M | M |
| 3 | M | M | M | M | M | M | M | M | M | M | M | M |
| 4 | M | M | M | M | M | M | M | M | M | M | M | M |
| 5 | N | N | N | M | M | M | M | M | M | M | M | M |
| 6 | M | M | M | M | M | M | M | M | M | M | M | M |
| 7 | M | M | M | M | M | M | M | M | M | M | M | M |
| 8 | M | M | M | M | M | M | M | M | M | M | M | M |
| 9 | M | M | M | M | M | M | M | M | M | M | M | M |
| 10 | M | M | M | M | M | M | M | M | M | M | M | M |
| 11 | M | M | M | M | M | M | M | M | M | M | M | M |
| 12 | M | M | M | M | M | M | M | M | M | M | M | M |
| 13 | M | M | M | M | M | M | M | M | M | M | M | M |
| 14 | M | M | M | M | M | M | M | M | M | M | M | M |
| 15 | M | M | M | M | M | M | M | M | M | M | M | M |
| 16 | M | M | M | M | M | M | M | M | M | M | M | M |
| 17 | M | M | M | M | M | M | M | M | M | M | M | M |
| 18 | M | M | M | M | M | M | N | N | N | 0 | 2 | 3 |
| 19 | 0 | 3 | 4 | N | N | N | N | N | N | 0 | 2 | 4 |
| 20 | 0 | 3 | 4 | N | N | N | N | N | N | 0 | 3 | 4 |
| 21 | 0 | 4 | 4 | N | N | N | N | N | N | 0 | 3 | 4 |
| 22 | 0 | 1 | 4 | N | N | N | N | N | N | N | N | N |
| 23 | N | N | N | N | N | N | N | N | N | N | N | N |
| 24 | N | N | N | N | N | N | N | N | N | 1 | 3 | 4 |
| 25 | 0 | 4 | 4 | N | N | N | N | N | N | 0 | 3 | 9 |
| 26 | 0 | 3 | 4 | N | N | N | N | N | N | 0 | 1 | 4 |
| 27 | 0 | 3 | 4 | N | N | N | N | N | N | N | N | N |
| 28 | 0 | 3 | 4 | N | N | N | N | N | N | 0 | 2 | 4 |
| 29 | N | N | N | N | N | N | N | N | N | N | N | N |
| 30 | 0 | 3 | 4 | N | N | N | N | N | N | 1 | 3 | 2 |
| 31 | 1 | 3 | 2 | N | N | N | N | N | N | N | N | N |

### ********************** SECOND INVERSION **********************

| DAY | 0000-0600 MST BASE (100M) | TOP (100M) | TYPE * | 0601-1200 MST BASE (100M) | TOP (100M) | TYPE * | 1201-1800 MST BASE (100M) | TOP (100M) | TYPE * | 1801-2400 MST BASE (100M) | TOP (100M) | TYPE * |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | M | M | M | M | M | M | M | M | M | M | M | M |
| 2 | M | M | M | M | M | M | M | M | M | M | M | M |
| 3 | M | M | M | M | M | M | M | M | M | M | M | M |
| 4 | M | M | M | M | M | M | M | M | M | M | M | M |
| 5 | N | N | N | M | M | M | M | M | M | M | M | M |
| 6 | M | M | M | M | M | M | M | M | M | M | M | M |
| 7 | M | M | M | M | M | M | M | M | M | M | M | M |
| 8 | M | M | M | M | M | M | M | M | M | M | M | M |
| 9 | M | M | M | M | M | M | M | M | M | M | M | M |
| 10 | M | M | M | M | M | M | M | M | M | M | M | M |
| 11 | M | M | M | M | M | M | M | M | M | M | M | M |
| 12 | M | M | M | M | M | M | M | M | M | M | M | M |
| 13 | M | M | M | M | M | M | M | M | M | M | M | M |
| 14 | M | M | M | M | M | M | M | M | M | M | M | M |
| 15 | M | M | M | M | M | M | M | M | M | M | M | M |
| 16 | M | M | M | M | M | M | M | M | M | M | M | M |
| 17 | M | M | M | M | M | M | M | M | M | M | M | M |
| 18 | M | M | M | M | M | M | N | N | N | N | N | N |
| 19 | N | N | N | N | N | N | N | N | N | N | N | N |
| 20 | N | N | N | N | N | N | N | N | N | N | N | N |
| 21 | N | N | N | N | N | N | N | N | N | N | N | N |
| 22 | N | N | N | N | N | N | N | N | N | N | N | N |
| 23 | N | N | N | N | N | N | N | N | N | N | N | N |
| 24 | N | N | N | N | N | N | N | N | N | N | N | N |
| 25 | N | N | N | N | N | N | N | N | N | N | N | N |
| 26 | N | N | N | N | N | N | N | N | N | N | N | N |
| 27 | N | N | N | N | N | N | N | N | N | N | N | N |
| 28 | N | N | N | N | N | N | N | N | N | N | N | N |
| 29 | N | N | N | N | N | N | N | N | N | N | N | N |
| 30 | N | N | N | N | N | N | N | N | N | N | N | N |
| 31 | N | N | N | N | N | N | N | N | N | N | N | N |

NOTE:* FOR TYPE 1=FRONTAL,2=SUBSIDENCE,3=RADIATION (SPIKED ECHO)
4=RADIATION (LAMINAR ECHO) 9=UNKNOWN
N=NO INVERSION,M=MISSING DATA OR UNKNOWN

```
                  ACOUSTIC RADAR ANALYSIS
ER LODGE VALLEY DISPERSION STUDY          MONTH OF MAY       1978
    ******* FIRST INVERSION FREQUENCY OF OCCURENCE TABLE *******
ICKNESS          INVERSION BASE HEIGHT (IN METERS)
METERS)  SFC   100  200  300  400  500  600  700  800  900   TOTAL
-TIME    0- 600 MST ---------------------------------------------
01-100     1     0    0    0    0    0    0    0    0    0      1
01-300     6     1    0    0    0    0    0    0    0    0      7
01-500     2     0    0    0    0    0    0    0    0    0      2
01-900     0     0    0    0    0    0    0    0    0    0      0
 INVERSION                                                      4
TOTAL      9     1    0    0    0    0    0    0    0    0     14
-TIME  601-1200 MST ---------------------------------------------
01-100     0     0    0    0    0    0    0    0    0    0      0
01-300     0     0    0    0    0    0    0    0    0    0      0
01-500     0     0    0    0    0    0    0    0    0    0      0
01-900     0     0    0    0    0    0    0    0    0    0      0
 INVERSION                                                     13
TOTAL      0     0    0    0    0    0    0    0    0    0     13
-TIME 1201-1800 MST ---------------------------------------------
01-100     0     0    0    0    0    0    0    0    0    0      0
01-300     0     0    0    0    0    0    0    0    0    0      0
01-500     0     0    0    0    0    0    0    0    0    0      0
01-900     0     0    0    0    0    0    0    0    0    0      0
 INVERSION                                                     14
TOTAL      0     0    0    0    0    0    0    0    0    0     14
-TIME 1801-2400 MST ---------------------------------------------
01-100     1     0    0    0    0    0    0    0    0    0      1
01-300     6     2    0    0    0    0    0    0    0    0      8
01-500     0     0    0    0    0    0    0    0    0    0      0
01-900     0     0    0    0    0    0    0    0    0    0      0
 INVERSION                                                      5
TOTAL      7     2    0    0    0    0    0    0    0    0     14

------------ FREQUENCY SUMMARY FOR FIRST INVERSION --------------
01-100     2     0    0    0    0    0    0    0    0    0      2
01-300    12     3    0    0    0    0    0    0    0    0     15
01-500     2     0    0    0    0    0    0    0    0    0      2
01-900     0     0    0    0    0    0    0    0    0    0      0
 INVERSION                                                     36
TOTAL     16     3    0    0    0    0    0    0    0    0     55
```

```
                              ACOUSTIC RADAR ANALYSIS
DEER LODGE VALLEY DISPERSION STUDY             MONTH OF MAY       1978
        ******* SECOND INVERSION FREQUENCY OF OCCURENCE TABLE ******
THICKNESS           INVERSION BASE HEIGHT (IN METERS)
 (METERS)   SFC    100    200    300    400    500    600    700    800    900    TOTAL
---TIME    0- 600 MST -------------------------------------------------------------------

 001-100     0      0      0      0      0      0      0      0      0      0        0
 101-300     0      0      0      0      0      0      0      0      0      0        0
 301-500     0      0      0      0      0      0      0      0      0      0        0
 501-900     0      0      0      0      0      0      0      0      0      0        0
NO INVERSION                                                                        14

  TOTAL      0      0      0      0      0      0      0      0      0      0       14
---TIME  601-1200 MST -------------------------------------------------------------------

 001-100     0      0      0      0      0      0      0      0      0      0        0
 101-300     0      0      0      0      0      0      0      0      0      0        0
 301-500     0      0      0      0      0      0      0      0      0      0        0
 501-900     0      0      0      0      0      0      0      0      0      0        0
NO INVERSION                                                                        13

  TOTAL      0      0      0      0      0      0      0      0      0      0       13
---TIME 1201-1800 MST -------------------------------------------------------------------

 001-100     0      0      0      0      0      0      0      0      0      0        0
 101-300     0      0      0      0      0      0      0      0      0      0        0
 301-500     0      0      0      0      0      0      0      0      0      0        0
 501-900     0      0      0      0      0      0      0      0      0      0        0
NO INVERSION                                                                        14

  TOTAL      0      0      0      0      0      0      0      0      0      0       14
---TIME 1801-2400 MST -------------------------------------------------------------------

 001-100     0      0      0      0      0      0      0      0      0      0        0
 101-300     0      0      0      0      0      0      0      0      0      0        0
 301-500     0      0      0      0      0      0      0      0      0      0        0
 501-900     0      0      0      0      0      0      0      0      0      0        0
NO INVERSION                                                                        14

  TOTAL      0      0      0      0      0      0      0      0      0      0       14

----------------- FREQUENCY SUMMARY FOR SECOND INVERSION --------------------------------

 001-100     0      0      0      0      0      0      0      0      0      0        0
 101-300     0      0      0      0      0      0      0      0      0      0        0
 301-500     0      0      0      0      0      0      0      0      0      0        0
 501-900     0      0      0      0      0      0      0      0      0      0        0
NO INVERSION                                                                        55

  TOTAL      0      0      0      0      0      0      0      0      0      0       55
```

```
                         ACOUSTIC RADAR ANALYSIS
DEER LODGE VALLEY DISPERSION STUDY           MONTH OF MAY        1978


********* TWO HOUR STABILITY ANALYSIS ****************************

      --------------------- HOUR ------------------------------
DAY    02   04   06   08   10   12   14   16   18   20   22   24
 1     M    M    M    M    M    M    M    M    M    M    M    M
 2     M    M    M    M    M    M    M    M    M    M    M    M
 3     M    M    M    M    M    M    M    M    M    M    M    M
 4     M    M    M    M    M    M    M    M    M    M    M    M
 5     M    M    M    M    M    M    M    M    M    M    M    M
 6     M    M    M    M    M    M    M    M    M    M    M    M
 7     M    M    M    M    M    M    M    M    M    M    M    M
 8     M    M    M    M    M    M    M    M    M    M    M    M
 9     M    M    M    M    M    M    M    M    M    M    M    M
10     M    M    M    M    M    M    M    M    M    M    M    M
11     M    M    M    M    M    M    M    M    M    M    M    M
12     M    M    M    M    M    M    M    M    M    M    M    M
13     M    M    M    M    M    M    M    M    M    M    M    M
14     M    M    M    M    M    M    M    M    M    M    M    M
15     M    M    M    M    M    M    M    M    M    M    M    M
16     M    M    M    M    M    M    M    M    M    M    M    M
17     M    M    M    M    M    M    M    M    M    M    M    M
18     M    M    M    M    M    M    M    B    D    D    M    M
19     M    M    M    D    B    B    B    B    B    D    M    M
20     M    M    M    M    D    B    B    B    B    D    M    M
21     M    M    M    D    B    B    D    B    D    D    M    M
22     M    D    D    D    B    B    D    D    D    D    D    D
23     D    D    D    D    D    B    B    B    D    D    D    D
24     D    D    D    D    D    B    D    D    D    D    D    M
25     M    M    M    D    B    B    B    B    B    M    M    M
26     M    M    M    D    B    B    B    B    B    D    M    M
27     M    M    M    D    B    B    B    B    B    D    D    M
28     M    M    M    D    D    B    B    B    B    D    M    M
29     D    D    D    B    B    B    B    B    B    B    D    M
30     M    M    D    B    D    D    D    B    M    M    M    D
31     M    D    D    B    B    B    B    B    B    D    D    M
           PERCENT FREQUENCY OF OCCURENCE FOR EACH CATEGORY

   A= 0.0 %  B=14.2 %  C= 0.0 %  D=16.1 %  E= 0.0 %  F= 0.0 %

   U= 0.0 %  M=69.6 %

NOTE: U=UNKNOWN M=MISSING DATA
      CLOUD COVER CONDITIONS USED FROM NWS STATION  AT BUTTE
      WIND DATA TAKEN AT SITE
```

ACOUSTIC RADAR ANALYSIS

DEER LODGE VALLEY DISPERSION STUDY MONTH OF JUNE 1978

*********************** FIRST INVERSION ***********************

| DAY | 0000-0600 MST | | | 0601-1200 MST | | | 1201-1800 MST | | | 1801-2400 MST | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * |
| 1 | 0 | 2 | 4 | N | N | N | N | N | N | 0 | 2 | 4 |
| 2 | 0 | 2 | 4 | N | N | N | N | N | N | 0 | 2 | 3 |
| 3 | 0 | 2 | 4 | N | N | N | N | N | N | 0 | 1 | 4 |
| 4 | 0 | 2 | 4 | N | N | N | N | N | N | 0 | 2 | 4 |
| 5 | 0 | 3 | 4 | N | N | N | N | N | N | N | N | N |
| 6 | 0 | 3 | 4 | N | N | N | N | N | N | 3 | 5 | 1 |
| 7 | 0 | 2 | 4 | N | N | N | N | N | N | N | N | N |
| 8 | 0 | 2 | 4 | N | N | N | N | N | N | 0 | 1 | 4 |
| 9 | 0 | 3 | 3 | N | N | N | N | N | N | N | N | N |
| 10 | N | N | N | N | N | N | N | N | N | 0 | 1 | 3 |
| 11 | 0 | 2 | 3 | N | N | N | N | N | N | 0 | 2 | 4 |
| 12 | 0 | 3 | 4 | N | N | N | N | N | N | 0 | 2 | 3 |
| 13 | 0 | 1 | 4 | N | N | N | N | N | N | 0 | 2 | 3 |
| 14 | 0 | 3 | 3 | N | N | N | N | N | N | 0 | 3 | 2 |
| 15 | N | N | N | N | N | N | N | N | N | N | N | N |
| 16 | 0 | 2 | 4 | N | N | N | N | N | N | 0 | 2 | 4 |
| 17 | 0 | 3 | 4 | N | N | N | N | N | N | 0 | 1 | 4 |
| 18 | 0 | 4 | 4 | N | N | N | N | N | N | 0 | 2 | 4 |
| 19 | 0 | 4 | 3 | N | N | N | N | N | N | 0 | 1 | 4 |
| 20 | 0 | 3 | 4 | N | N | N | N | N | N | 0 | 1 | 4 |
| 21 | 0 | 2 | 4 | N | N | N | N | N | N | N | N | N |
| 22 | 0 | 3 | 3 | N | N | N | N | N | N | N | N | N |
| 23 | 0 | 2 | 4 | N | N | N | N | N | N | 0 | 2 | 4 |
| 24 | 0 | 1 | 4 | N | N | N | N | N | N | N | N | N |
| 25 | 0 | 2 | 4 | N | N | N | N | N | N | N | N | N |
| 26 | 0 | 3 | 4 | N | N | N | N | N | N | 0 | 2 | 4 |
| 27 | 0 | 2 | 4 | N | N | N | N | N | N | 0 | 1 | 4 |
| 28 | 0 | 2 | 4 | N | N | N | N | N | N | 0 | 1 | 4 |
| 29 | 0 | 2 | 4 | N | N | N | N | N | N | 0 | 3 | 3 |
| 30 | 0 | 2 | 4 | N | N | N | N | N | N | 0 | 1 | 4 |

*********************** SECOND INVERSION ***********************

| DAY | 0000-0600 MST | | | 0601-1200 MST | | | 1201-1800 MST | | | 1801-2400 MST | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * |
| 1 | N | N | N | N | N | N | N | N | N | N | N | N |
| 2 | N | N | N | N | N | N | N | N | N | N | N | N |
| 3 | N | N | N | N | N | N | N | N | N | N | N | N |
| 4 | N | N | N | N | N | N | N | N | N | N | N | N |
| 5 | N | N | N | N | N | N | N | N | N | N | N | N |
| 6 | N | N | N | N | N | N | N | N | N | N | N | N |
| 7 | 2 | 3 | 1 | N | N | N | N | N | N | N | N | N |
| 8 | N | N | N | N | N | N | N | N | N | N | N | N |
| 9 | N | N | N | N | N | N | N | N | N | N | N | N |
| 10 | N | N | N | N | N | N | N | N | N | N | N | N |
| 11 | N | N | N | N | N | N | N | N | N | N | N | N |
| 12 | N | N | N | N | N | N | N | N | N | N | N | N |
| 13 | 4 | 5 | 9 | N | N | N | N | N | N | N | N | N |
| 14 | N | N | N | N | N | N | N | N | N | N | N | N |
| 15 | N | N | N | N | N | N | N | N | N | N | N | N |
| 16 | N | N | N | N | N | N | N | N | N | N | N | N |
| 17 | N | N | N | N | N | N | N | N | N | N | N | N |
| 18 | N | N | N | N | N | N | N | N | N | N | N | N |
| 19 | N | N | N | N | N | N | N | N | N | N | N | N |
| 20 | N | N | N | N | N | N | N | N | N | N | N | N |
| 21 | N | N | N | N | N | N | N | N | N | N | N | N |
| 22 | N | N | N | N | N | N | N | N | N | N | N | N |
| 23 | N | N | N | N | N | N | N | N | N | N | N | N |
| 24 | N | N | N | N | N | N | N | N | N | N | N | N |
| 25 | N | N | N | N | N | N | N | N | N | N | N | N |
| 26 | N | N | N | N | N | N | N | N | N | N | N | N |
| 27 | N | N | N | N | N | N | N | N | N | N | N | N |
| 28 | N | N | N | N | N | N | N | N | N | N | N | N |
| 29 | N | N | N | N | N | N | N | N | N | N | N | N |
| 30 | N | N | N | N | N | N | N | N | N | N | N | N |

NOTE: FOR TYPE 1=FRONTAL,2=SUBSIDENCE,3=RADIATION (SPIKED ECHO)
4=RADIATION (LAMINAR ECHO) 9=UNKNOWN
N=NO INVERSION M=MISSING DATA OR UNKNOWN

```
                         ACOUSTIC RADAR ANALYSIS
ER LODGE VALLEY DISPERSION STUDY           MONTH OF JUNE     1978
     ******* FIRST INVERSION FREQUENCY OF OCCURENCE TABLE *******
ICKNESS          INVERSION BASE HEIGHT (IN METERS)
METERS)  SFC    100    200    300    400    500    600    700    800    900     TOTAL
-TIME      0- 600 MST ------------------------------------------------------------------
01-100      2      0      0      0      0      0      0      0      0      0        2
01-300     24      0      0      0      0      0      0      0      0      0       24
01-500      2      0      0      0      0      0      0      0      0      0        2
01-900      0      0      0      0      0      0      0      0      0      0        0
 INVERSION                                                                          2
TOTAL      28      0      0      0      0      0      0      0      0      0       30
-TIME   601-1200 MST ------------------------------------------------------------------
01-100      0      0      0      0      0      0      0      0      0      0        0
01-300      0      0      0      0      0      0      0      0      0      0        0
01-500      0      0      0      0      0      0      0      0      0      0        0
01-900      0      0      0      0      0      0      0      0      0      0        0
 INVERSION                                                                         30
TOTAL       0      0      0      0      0      0      0      0      0      0       30
-TIME  1201-1800 MST ------------------------------------------------------------------
01-100      0      0      0      0      0      0      0      0      0      0        0
01-300      0      0      0      0      0      0      0      0      0      0        0
01-500      0      0      0      0      0      0      0      0      0      0        0
01-900      0      0      0      0      0      0      0      0      0      0        0
 INVERSION                                                                         30
TOTAL       0      0      0      0      0      0      0      0      0      0       30
-TIME  1801-2400 MST ------------------------------------------------------------------
01-100      9      0      0      0      0      0      0      0      0      0        9
01-300     12      0      0      1      0      0      0      0      0      0       13
01-500      0      0      0      0      0      0      0      0      0      0        0
01-900      0      0      0      0      0      0      0      0      0      0        0
 INVERSION                                                                          8
TOTAL      21      0      0      1      0      0      0      0      0      0       30

--------------- FREQUENCY SUMMARY FOR FIRST INVERSION ----------------------------------
01-100     11      0      0      0      0      0      0      0      0      0       11
01-300     36      0      0      1      0      0      0      0      0      0       37
01-500      2      0      0      0      0      0      0      0      0      0        2
01-900      0      0      0      0      0      0      0      0      0      0        0
 INVERSION                                                                         70
TOTAL      49      0      0      1      0      0      0      0      0      0      120
```

```
                              ACOUSTIC RADAR ANALYSIS
DEER LODGE VALLEY DISPERSION STUDY              MONTH OF JUNE      1978
         ******* SECOND INVERSION FREQUENCY OF OCCURENCE TABLE ******
THICKNESS          INVERSION BASE HEIGHT (IN METERS)
 (METERS)   SFC    100    200    300    400    500    600    700    800    900   TOTAL
---TIME     0- 600 MST -------------------------------------------------------------

 001-100     0      0      1      0      1      0      0      0      0      0      2
 101-300     0      0      0      0      0      0      0      0      0      0      0
 301-500     0      0      0      0      0      0      0      0      0      0      0
 501-900     0      0      0      0      0      0      0      0      0      0      0
NO INVERSION                                                                       28

  TOTAL      0      0      1      0      1      0      0      0      0      0     30
---TIME   601-1200 MST -------------------------------------------------------------

 001-100     0      0      0      0      0      0      0      0      0      0      0
 101-300     0      0      0      0      0      0      0      0      0      0      0
 301-500     0      0      0      0      0      0      0      0      0      0      0
 501-900     0      0      0      0      0      0      0      0      0      0      0
NO INVERSION                                                                       30

  TOTAL      0      0      0      0      0      0      0      0      0      0     30
---TIME  1201-1800 MST -------------------------------------------------------------

 001-100     0      0      0      0      0      0      0      0      0      0      0
 101-300     0      0      0      0      0      0      0      0      0      0      0
 301-500     0      0      0      0      0      0      0      0      0      0      0
 501-900     0      0      0      0      0      0      0      0      0      0      0
NO INVERSION                                                                       30

  TOTAL      0      0      0      0      0      0      0      0      0      0     30
---TIME  1801-2400 MST -------------------------------------------------------------

 001-100     0      0      0      0      0      0      0      0      0      0      0
 101-300     0      0      0      0      0      0      0      0      0      0      0
 301-500     0      0      0      0      0      0      0      0      0      0      0
 501-900     0      0      0      0      0      0      0      0      0      0      0
NO INVERSION                                                                       30

  TOTAL      0      0      0      0      0      0      0      0      0      0     30

----------------- FREQUENCY SUMMARY FOR SECOND INVERSION ----------------------------

 001-100     0      0      1      0      1      0      0      0      0      0      2
 101-300     0      0      0      0      0      0      0      0      0      0      0
 301-500     0      0      0      0      0      0      0      0      0      0      0
 501-900     0      0      0      0      0      0      0      0      0      0      0
NO INVERSION                                                                      118

  TOTAL      0      0      1      0      1      0      0      0      0      0    120
```

```
                         ACOUSTIC RADAR ANALYSIS
ER LODGE VALLEY DISPERSION STUDY          MONTH OF JUNE      1978

****** TWO HOUR STABILITY ANALYSIS ****************************

   --------------------- HOUR ---------------------------------
Y   02    04    06    08    10    12    14    16    18    20    22    24
     M     M     D     B     B     M     M     C     C     D     M     M
     E     M     E     D     B     M     C     C     C     D     M     M
     M     M     M     D     B     M     C     C     C     D     M     M
     M     E     E     D     B     M     M     C     C     D     M     E
     E     E     E     D     C     C     B     C     C     D     D     M
     M     M     M     D     C     C     C     C     C     D     D     D
     M     M     M     D     C     C     C     C     C     D     C     E
     M     M     M     D     C     C     C     C     C     D     M     M
     M     M     M     D     C     C     C     C     C     D     D     D
     D     D     D     C     C     C     C     D     D     D     M     E
     M     M     D     C     C     C     C     M     C     D     M     E
     E     E     M     D     C     C     C     C     D     D     M     M
     M     E     E     D     C     C     C     C     C     M     M     M
     M     M     D     B     M     M     C     C     C     D     M     M
     D     D     D     B     B     C     C     C     C     C     D     C
     M     M     M     D     C     C     C     C     C     C     M     M
     M     E     E     D     C     M     M     C     C     D     M     E
     E     M     M     D     C     C     C     D     D     D     M     D
     M     M     M     D     C     C     C     C     C     D     M     E
     E     E     E     D     C     C     C     C     C     D     M     E
     E     E     E     D     B     C     C     C     C     D     D     D
     D     E     E     D     C     C     C     C     C     D     M     M
     M     M     M     D     B     C     C     C     C     D     M     D
     M     E     M     D     B     B     C     M     C     D     D     D
     D     M     E     D     C     C     C     C     C     C     D     D
     M     M     M     D     B     M     C     C     C     M     M     M
     E     E     E     D     M     M     M     C     C     D     M     M
     E     E     E     D     B     M     C     C     C     E     M     M
     E     E     D     C     B     M     C     C     C     E     M     M
     D     M     E     D     M     D     M     M     C     D     M     M
          PERCENT FREQUENCY OF OCCURENCE FOR EACH CATEGORY
  A= 0.0 %  B= 4.4 %  C=32.5 %  D=22.5 %  E=11.7 %  F= 0.0 %
  U= 0.0 %  M=28.9 %
TE: U=UNKNOWN M=MISSING DATA
     CLOUD COVER CONDITIONS USED FROM NWS STATION  AT BUTTE
     WIND DATA TAKEN AT SITE
```

```
                                ACOUSTIC RADAR ANALYSIS
 DEER LODGE VALLEY DISPERSION STUDY              MONTH OF JULY       1978

 ************************ FIRST INVERSION ***********************************
         0000-0600 MST        0601-1200 MST         1201-1800 MST         1801-2400 MST
 DAY      BASE TOP  TYPE      BASE  TOP  TYPE       BASE  TOP  TYPE       BASE  TOP  TYPE
         (100M)(100M) *      (100M)(100M) *        (100M)(100M) *        (100M)(100M) *

  1        0     2    4        N     N    N          N     N    N          N     N    N
  2        0     3    4        3     4    4          N     N    N          0     3    4
  3        0     2    4        N     N    N          N     N    N          M     M    M
  4        M     M    M        M     M    M          M     M    M          M     M    M
  5        M     M    M        M     M    M          N     N    N          N     N    N
  6        0     1    4        N     N    N          N     N    N          N     N    N
  7        0     1    4        N     N    N          N     N    N          N     N    N
  8        0     1    4        N     N    N          N     N    N          N     N    N
  9        N     N    N        N     N    N          N     N    N          0     1    4
 10        0     1    4        N     N    N          N     N    N          0     1    4
 11        N     N    N        N     N    N          N     N    N          0     2    4
 12        0     1    4        N     N    N          N     N    N          0     1    4
 13        0     1    4        N     N    N          N     N    N          0     1    4
 14        0     1    4        N     N    N          N     N    N          0     2    4
 15        N     N    N        N     N    N          M     M    M          M     M    M
 16        M     M    M        M     M    M          M     M    M          M     M    M
 17        M     M    M        M     M    M          M     M    M          M     M    M
 18        M     M    M        M     M    M          M     M    M          M     M    M
 19        0     3    4        N     N    N          N     N    N          N     N    N
 20        N     N    N        N     N    N          N     N    N          0     1    4
 21        0     2    4        N     N    N          N     N    N          0     2    4
 22        0     2    4        N     N    N          N     N    N          0     2    4
 23        0     3    4        N     N    N          N     N    N          0     2    4
 24        0     2    4        N     N    N          N     N    N          0     2    4
 25        0     2    4        N     N    N          N     N    N          0     1    4
 26        0     2    4        N     N    N          N     N    N          0     1    4
 27        0     2    4        N     N    N          N     N    N          N     N    N
 28        0     1    4        N     N    N          N     N    N          N     N    N
 29        0     4    3        N     N    N          N     N    N          0     1    4
 30        0     1    4        N     N    N          N     N    N          0     1    4
 31        0     1    4        N     N    N          N     N    N          N     N    N

 ************************ SECOND INVERSION **********************************
         0000-0600 MST        0601-1200 MST         1201-1800 MST         1801-2400 MST
 DAY      BASE TOP  TYPE      BASE  TOP  TYPE       BASE  TOP  TYPE       BASE  TOP  TYPE
         (100M)(100M) *      (100M)(100M) *        (100M)(100M) *        (100M)(100M) *

  1        3     5    2        N     N    N          N     N    N          N     N    N
  2        N     N    N        N     N    N          N     N    N          N     N    N
  3        N     N    N        2     4    4          N     N    N          M     M    M
  4        M     M    M        M     M    M          M     M    M          M     M    M
  5        M     M    M        M     M    M          N     N    N          N     N    N
  6        N     N    N        N     N    N          N     N    N          N     N    N
  7        N     N    N        N     N    N          N     N    N          N     N    N
  8        N     N    N        N     N    N          N     N    N          N     N    N
  9        N     N    N        N     N    N          N     N    N          N     N    N
 10        N     N    N        N     N    N          N     N    N          N     N    N
 11        N     N    N        N     N    N          N     N    N          N     N    N
 12        N     N    N        N     N    N          N     N    N          N     N    N
 13        N     N    N        N     N    N          N     N    N          N     N    N
 14        N     N    N        N     N    N          N     N    N          N     N    N
 15        N     N    N        N     N    N          M     M    M          M     M    M
 16        M     M    M        M     M    M          M     M    M          M     M    M
 17        M     M    M        M     M    M          M     M    M          M     M    M
 18        M     M    M        M     M    M          M     M    M          M     M    M
 19        M     M    M        N     N    N          N     N    N          N     N    N
 20        N     N    N        N     N    N          N     N    N          N     N    N
 21        N     N    N        N     N    N          N     N    N          N     N    N
 22        N     N    N        N     N    N          N     N    N          N     N    N
 23        N     N    N        N     N    N          N     N    N          N     N    N
 24        N     N    N        N     N    N          N     N    N          N     N    N
 25        N     N    N        N     N    N          N     N    N          N     N    N
 26        N     N    N        N     N    N          N     N    N          N     N    N
 27        N     N    N        N     N    N          N     N    N          N     N    N
 28        N     N    N        N     N    N          N     N    N          N     N    N
 29        N     N    N        N     N    N          N     N    N          N     N    N
 30        N     N    N        N     N    N          N     N    N          N     N    N
 31        N     N    N        N     N    N          N     N    N          N     N    N

      NOTE:  FOR TYPE 1=FRONTAL,2=SUBSIDENCE,3=RADIATION (SPIKED ECHO)
                      4=RADIATION (LAMINAR ECHO) 9=UNKNOWN
             N=NO INVERSION M=MISSING DATA OR UNKNOWN
```

```
                               ACOUSTIC RADAR ANALYSIS

ER LODGE VALLEY DISPERSION STUDY            MONTH OF JULY     1978

       ******* FIRST INVERSION FREQUENCY OF OCCURENCE TABLE *******

ICKNESS          INVERSION BASE HEIGHT (IN METERS)
METERS)  SFC    100    200    300    400    500    600    700    800    900    TOTAL

-TIME     0- 600 MST -------------------------------------------------------------------

01-100    10      0      0      0      0      0      0      0      0      0      10
01-300    11      0      0      0      0      0      0      0      0      0      11
01-500     1      0      0      0      0      0      0      0      0      0       1
01-900     0      0      0      0      0      0      0      0      0      0       0
 INVERSION                                                                       4

TOTAL     22      0      0      0      0      0      0      0      0      0      26

-TIME  601-1200 MST -------------------------------------------------------------------

01-100     0      0      0      1      0      0      0      0      0      0       1
01-300     0      0      0      0      0      0      0      0      0      0       0
01-500     0      0      0      0      0      0      0      0      0      0       0
01-900     0      0      0      0      0      0      0      0      0      0       0
 INVERSION                                                                      25

TOTAL      0      0      0      1      0      0      0      0      0      0      26

-TIME 1201-1800 MST -------------------------------------------------------------------

01-100     0      0      0      0      0      0      0      0      0      0       0
01-300     0      0      0      0      0      0      0      0      0      0       0
01-500     0      0      0      0      0      0      0      0      0      0       0
01-900     0      0      0      0      0      0      0      0      0      0       0
 INVERSION                                                                      26

TOTAL      0      0      0      0      0      0      0      0      0      0      26

-TIME 1801-2400 MST -------------------------------------------------------------------

01-100     9      0      0      0      0      0      0      0      0      0       9
01-300     7      0      0      0      0      0      0      0      0      0       7
01-500     0      0      0      0      0      0      0      0      0      0       0
01-900     0      0      0      0      0      0      0      0      0      0       0
 INVERSION                                                                       9

TOTAL     16      0      0      0      0      0      0      0      0      0      25

--------------- FREQUENCY SUMMARY FOR FIRST INVERSION ---------------------------------

01-100    19      0      0      1      0      0      0      0      0      0      20
01-300    18      0      0      0      0      0      0      0      0      0      18
01-500     1      0      0      0      0      0      0      0      0      0       1
01-900     0      0      0      0      0      0      0      0      0      0       0
 INVERSION                                                                      64

TOTAL     38      0      0      1      0      0      0      0      0      0     103
```

```
                         ACOUSTIC RADAR ANALYSIS
 DEER LODGE VALLEY DISPERSION STUDY          MONTH OF JULY      1978
        ******* SECOND INVERSION FREQUENCY OF OCCURENCE TABLE ******
 THICKNESS          INVERSION BASE HEIGHT (IN METERS)
  (METERS)   SFC    100    200    300    400    500    600    700    800    900    TOTAL
 ---TIME    0- 600 MST --------------------------------------------------------------------
  001-100          0      0      0      0      0      0      0      0      0      0      0
  101-300          0      0      0      1      0      0      0      0      0      0      1
  301-500          0      0      0      0      0      0      0      0      0      0      0
  501-900          0      0      0      0      0      0      0      0      0      0      0
 NO INVERSION                                                                           24
   TOTAL           0      0      0      1      0      0      0      0      0      0     25
 ---TIME  601-1200 MST --------------------------------------------------------------------
  001-100          0      0      0      0      0      0      0      0      0      0      0
  101-300          0      0      1      0      0      0      0      0      0      0      1
  301-500          0      0      0      0      0      0      0      0      0      0      0
  501-900          0      0      0      0      0      0      0      0      0      0      0
 NO INVERSION                                                                           25
   TOTAL           0      0      1      0      0      0      0      0      0      0     26
 ---TIME 1201-1800 MST --------------------------------------------------------------------
  001-100          0      0      0      0      0      0      0      0      0      0      0
  101-300          0      0      0      0      0      0      0      0      0      0      0
  301-500          0      0      0      0      0      0      0      0      0      0      0
  501-900          0      0      0      0      0      0      0      0      0      0      0
 NO INVERSION                                                                           26
   TOTAL           0      0      0      0      0      0      0      0      0      0     26
 ---TIME 1801-2400 MST --------------------------------------------------------------------
  001-100          0      0      0      0      0      0      0      0      0      0      0
  101-300          0      0      0      0      0      0      0      0      0      0      0
  301-500          0      0      0      0      0      0      0      0      0      0      0
  501-900          0      0      0      0      0      0      0      0      0      0      0
 NO INVERSION                                                                           25
   TOTAL           0      0      0      0      0      0      0      0      0      0     25

 ----------------- FREQUENCY SUMMARY FOR SECOND INVERSION ---------------------------------
  001-100          0      0      0      0      0      0      0      0      0      0      0
  101-300          0      0      1      1      0      0      0      0      0      0      2
  301-500          0      0      0      0      0      0      0      0      0      0      0
  501-900          0      0      0      0      0      0      0      0      0      0      0
 NO INVERSION                                                                          100
   TOTAL           0      0      1      1      0      0      0      0      0      0    102
```

```
                    ACOUSTIC RADAR ANALYSIS
EER LODGE VALLEY DISPERSION STUDY          MONTH OF JULY      1978


****** TWO HOUR STABILITY ANALYSIS **************************

      ---------------------- HOUR ------------------------------
AY    02    04    06    08    10    12    14    16    18    20    22    24
1     E     E     M     D     B     C     C     D     D     D     D     D
2     M     M     M     D     B     M     M     C     D     E     M     M
3     M     M     M     D     B     B     D     M     M     M     M     M
4     M     M     M     M     M     M     M     M     M     M     M     M
5     M     M     M     M     M     M     M     M     C     D     D     D
6     M     M     M     D     B     B     M     C     D     C     D     M
7     M     M     M     D     M     C     C     C     C     D     C     M
8     M     M     E     D     B     C     D     M     D     C     D     D
9     D     D     D     B     C     C     C     C     C     D     M     M
1)    M     M     M     D     B     C     C     C     C     D     M     M
1l    D     D     D     B     M     C     C     C     C     C     M     M
12    M     M     M     D     M     M     M     C     C     D     M     E
13    E     E     E     D     C     C     C     C     C     D     M     M
14    M     M     E     D     C     C     C     C     C     D     M     E
15    E     E     E     E     D     C     M     M     M     M     M     M
16    M     M     M     M     M     M     M     M     M     M     M     M
17    M     M     M     M     M     M     M     M     M     M     M     M
18    M     M     M     M     M     M     M     M     M     M     M     M
19    M     M     M     D     B     M     D     D     C     D     D     M
)     D     D     D     B     M     D     D     C     B     C     M     M
1     E     M     M     D     B     M     M     M     C     D     M     E
2     E     E     E     D     B     M     M     M     C     D     M     E
3     E     E     E     D     C     C     C     C     C     D     M     E
4     M     E     E     D     B     C     D     D     D     D     E     E
5     E     M     M     D     C     C     C     C     C     D     M     M
6     M     E     M     D     C     C     C     C     C     D     M     M
7     E     E     D     B     B     C     C     C     C     D     D     M
8     M     E     E     D     M     B     D     D     C     D     D     D
9     M     M     E     D     B     M     C     C     C     C     M     E
)     E     E     E     D     M     M     C     C     C     D     M     M
1     M     M     E     D     B     M     C     C     C     D     D     M
         PERCENT FREQUENCY OF OCCURENCE FOR EACH CATEGORY
  A= 0.0 %  B= 5.6 %  C=19.6 %  D=22.0 %  E=10.8 %  F= 0.0 %
  U= 0.0 %  M=41.9 %
TE:  U=UNKNOWN M=MISSING DATA
     CLOUD COVER CONDITIONS USED FROM NWS STATION  AT BUTTE
     WIND DATA TAKEN AT SITE
```

```
                                ACOUSTIC RADAR ANALYSIS

DEER LODGE VALLEY DISPERSION STUDY                 MONTH OF AUGUST   1978

*********************** FIRST INVERSION ************************************
      0000-0600 MST       0601-1200 MST        1201-1800 MST       1801-2400 MST
DAY    BASE TOP  TYPE     BASE  TOP  TYPE      BASE  TOP  TYPE     BASE  TOP  TYPE
      (100M)(100M) *     (100M)(100M) *       (100M)(100M) *      (100M)(100M) *

  1      0     2    4      N     N     N        N     N     N       0     1     4
  2      2     4    2      N     N     N        N     N     N       0     1     4
  3      0     1    4      N     N     N        N     N     N       0     2     4
  4      0     2    4      N     N     N        N     N     N       0     1     4
  5      0     2    4      N     N     N        N     N     N       0     1     4
  6      0     3    4      N     N     N        N     N     N       0     1     4
  7      0     2    4      N     N     N        N     N     N       0     2     4
  8      0     2    4      N     N     N        N     N     N       0     2     4
  9      0     2    4      N     N     N        N     N     N       0     2     3
 10      0     2    3      N     N     N        N     N     N       0     1     4
 11      0     2    4      N     N     N        N     N     N       0     1     4
 12      0     1    4      N     N     N        N     N     N       N     N     N
 13      0     3    3      N     N     N        N     N     N       0     2     3
 14      0     3    3      N     N     N        N     N     N       0     1     4
 15      0     3    3      N     N     N        N     N     N       0     3     3
 16      0     2    3      N     N     N        N     N     N       0     2     3
 17      0     4    3      N     N     N        N     N     N       0     4     4
 18      0     3    4      N     N     N        N     N     N       0     1     4
 19      0     3    4      N     N     N        N     N     N       0     1     4
 20      0     1    4      N     N     N        N     N     N       N     N     N
 21      0     1    4      N     N     N        N     N     N       0     1     4
 22      0     1    4      N     N     N        N     N     N       0     2     3
 23      0     2    4      N     N     N        N     N     N       0     1     4
 24      0     3    4      N     N     N        N     N     N       0     1     4
 25      0     2    4      N     N     N        N     N     N       0     2     3
 26      N     N    N      N     N     N        N     N     N       N     N     N
 27      N     N    N      N     N     N        N     N     N       0     1     4
 28      0     3    4      N     N     N        N     N     N       0     1     4
 29      0     1    4      N     N     N        N     N     N       0     1     4
 30      0     1    4      N     N     N        N     N     N       0     1     4
 31      0     5    3      N     N     N        N     N     N       0     1     4

*********************** SECOND INVERSION ***********************************
      0000-0600 MST       0601-1200 MST        1201-1800 MST       1801-2400 MST
DAY    BASE TOP  TYPE     BASE  TOP  TYPE      BASE  TOP  TYPE     BASE  TOP  TYPE
      (100M)(100M) *     (100M)(100M) *       (100M)(100M) *      (100M)(100M) *

  1      N     N    N      N     N     N        N     N     N       2     4     2
  2      N     N    N      N     N     N        N     N     N       N     N     N
  3      N     N    N      N     N     N        N     N     N       N     N     N
  4      N     N    N      N     N     N        N     N     N       N     N     N
  5      N     N    N      N     N     N        N     N     N       N     N     N
  6      N     N    N      N     N     N        N     N     N       N     N     N
  7      N     N    N      N     N     N        N     N     N       N     N     N
  8      N     N    N      N     N     N        N     N     N       N     N     N
  9      N     N    N      N     N     N        N     N     N       N     N     N
 10      N     N    N      N     N     N        N     N     N       N     N     N
 11      N     N    N      N     N     N        N     N     N       N     N     N
 12      N     N    N      N     N     N        N     N     N       N     N     N
 13      N     N    N      N     N     N        N     N     N       N     N     N
 14      N     N    N      N     N     N        N     N     N       N     N     N
 15      N     N    N      N     N     N        N     N     N       N     N     N
 16      N     N    N      N     N     N        N     N     N       N     N     N
 17      N     N    N      N     N     N        N     N     N       N     N     N
 18      N     N    N      N     N     N        N     N     N       N     N     N
 19      N     N    N      N     N     N        N     N     N       N     N     N
 20      N     N    N      N     N     N        N     N     N       3     6     2
 21      6     9    2      N     N     N        N     N     N       N     N     N
 22      3     6    2      N     N     N        N     N     N       N     N     N
 23      N     N    N      N     N     N        N     N     N       N     N     N
 24      5     9    2      N     N     N        N     N     N       N     N     N
 25      N     N    N      N     N     N        N     N     N       N     N     N
 26      N     N    N      N     N     N        N     N     N       N     N     N
 27      N     N    N      N     N     N        N     N     N       N     N     N
 28      N     N    N      N     N     N        N     N     N       N     N     N
 29      N     N    N      N     N     N        N     N     N       N     N     N
 30      N     N    N      N     N     N        N     N     N       N     N     N
 31      N     N    N      N     N     N        N     N     N       N     N     N

     NOTE;  FOR TYPE 1=FRONTAL,2=SUBSIDENCE,3=RADIATION (SPIKED ECHO)
                     4=RADIATION (LAMINAR ECHO) 5=UNKNOWN
               N=NO INVERSION M=MISSING DATA OR UNKNOWN
```

```
                          ACOUSTIC RADAR ANALYSIS

ER LODGE VALLEY DISPERSION STUDY             MONTH OF AUGUST    1978

    ******* FIRST INVERSION FREQUENCY OF OCCURENCE TABLE *******

ICKNESS           INVERSION BASE HEIGHT (IN METERS)
METERS)  SFC    100    200    300    400    500    600    700    800    900     TOTAL

-TIME     0- 600 MST -----------------------------------------------------------------

01-100      7      0      0      0      0      0      0      0      0      0         7
01-300     19      0      1      0      0      0      0      0      0      0        20
01-500      2      0      0      0      0      0      0      0      0      0         2
01-900      0      0      0      0      0      0      0      0      0      0         0
 INVERSION                                                                           2

TOTAL      28      0      1      0      0      0      0      0      0      0        31

-TIME   601-1200 MST -----------------------------------------------------------------

01-100      0      0      0      0      0      0      0      0      0      0         0
01-300      0      0      0      0      0      0      0      0      0      0         0
01-500      0      0      0      0      0      0      0      0      0      0         0
01-900      0      0      0      0      0      0      0      0      0      0         0
 INVERSION                                                                          31

TOTAL       0      0      0      0      0      0      0      0      0      0        31

-TIME 1201-1800 MST ------------------------------------------------------------------

01-100      0      0      0      0      0      0      0      0      0      0         0
01-300      0      0      0      0      0      0      0      0      0      0         0
01-500      0      0      0      0      0      0      0      0      0      0         0
01-900      0      0      0      0      0      0      0      0      0      0         0
 INVERSION                                                                          31

TOTAL       0      0      0      0      0      0      0      0      0      0        31

-TIME 1801-2400 MST ------------------------------------------------------------------

01-100     18      0      0      0      0      0      0      0      0      0        18
01-300      9      0      0      0      0      0      0      0      0      0         9
01-500      1      0      0      0      0      0      0      0      0      0         1
01-900      0      0      0      0      0      0      0      0      0      0         0
 INVERSION                                                                           3

TOTAL      28      0      0      0      0      0      0      0      0      0        31


--------------- FREQUENCY SUMMARY FOR FIRST INVERSION --------------------------------

01-100     25      0      0      0      0      0      0      0      0      0        25
01-300     28      0      1      0      0      0      0      0      0      0        29
01-500      3      0      0      0      0      0      0      0      0      0         3
01-900      0      0      0      0      0      0      0      0      0      0         0
 INVERSION                                                                          67

TOTAL      56      0      1      0      0      0      0      0      0      0       124
```

```
                          ACOUSTIC RADAR ANALYSIS
DEER LODGE VALLEY DISPERSION STUDY           MONTH OF AUGUST   1978
      ******* SECOND INVERSION FREQUENCY OF OCCURENCE TABLE ******
THICKNESS          INVERSION BASE HEIGHT (IN METERS)
 (METERS)  SFC   100   200   300   400   500   600   700   800   900   TOTAL
---TIME    0- 600 MST --------------------------------------------------------
 001-100    0     0     0     0     0     0     0     0     0     0       0
 101-300    0     0     0     1     0     0     1     0     0     0       2
 301-500    0     0     0     0     0     1     0     0     0     0       1
 501-900    0     0     0     0     0     0     0     0     0     0       0
NO INVERSION                                                             28
  TOTAL     0     0     0     1     0     1     1     0     0     0      31
---TIME  601-1200 MST --------------------------------------------------------
 001-100    0     0     0     0     0     0     0     0     0     0       0
 101-300    0     0     0     0     0     0     0     0     0     0       0
 301-500    0     0     0     0     0     0     0     0     0     0       0
 501-900    0     0     0     0     0     0     0     0     0     0       0
NO INVERSION                                                             31
  TOTAL     0     0     0     0     0     0     0     0     0     0      31
---TIME 1201-1800 MST --------------------------------------------------------
 001-100    0     0     0     0     0     0     0     0     0     0       0
 101-300    0     0     0     0     0     0     0     0     0     0       0
 301-500    0     0     0     0     0     0     0     0     0     0       0
 501-900    0     0     0     0     0     0     0     0     0     0       0
NO INVERSION                                                             31
  TOTAL     0     0     0     0     0     0     0     0     0     0      31
---TIME 1801-2400 MST --------------------------------------------------------
 001-100    0     0     0     0     0     0     0     0     0     0       0
 101-300    0     0     1     1     0     0     0     0     0     0       2
 301-500    0     0     0     0     0     0     0     0     0     0       0
 501-900    0     0     0     0     0     0     0     0     0     0       0
NO INVERSION                                                             29
  TOTAL     0     0     1     1     0     0     0     0     0     0      31

----------------- FREQUENCY SUMMARY FOR SECOND INVERSION ------------------
 001-100    0     0     0     0     0     0     0     0     0     0       0
 101-300    0     0     1     2     0     0     1     0     0     0       4
 301-500    0     0     0     0     0     1     0     0     0     0       1
 501-900    0     0     0     0     0     0     0     0     0     0       0
NO INVERSION                                                            119
  TOTAL     0     0     1     2     0     1     1     0     0     0     124
```

```
                       ACOUSTIC RADAR ANALYSIS
EER LODGE VALLEY DISPERSION STUDY          MONTH OF AUGUST   1978


******** TWO HOUR STABILITY ANALYSIS ***************************

       ---------------------- HOUR ---------------------------------
AY    02    04    06    08    10    12    14    16    18    20    22    24
1      M     M     M     D     B     M     C     C     C     D     M     D
2      D     D     D     B     B     M     M     C     C     D     M     M
3      M     M     M     D     B     M     C     C     C     D     M     E
4      E     E     E     D     B     C     C     C     C     D     M     E
5      E     E     D     D     B     B     M     C     C     C     M     E
6      M     E     E     D     C     C     C     C     C     D     M     M
7      M     E     E     D     C     C     C     C     C     D     M     M
8      E     E     E     D     M     M     C     C     C     D     M     E
9      E     E     E     D     C     C     C     D     C     D     E     M
0      M     M     M     D     C     C     C     C     C     D     M     M
1      M     M     E     D     M     C     C     C     C     D     M     M
2      E     E     M     D     B     M     C     C     C     D     D     E
3      M     D     D     D     B     D     D     M     D     D     D     D
4      M     M     D     D     C     C     C     C     C     D     M     M
5      M     M     M     D     C     C     C     C     C     D     M     D
6      D     D     M     D     B     M     D     C     C     M     D     M
7      M     M     M     D     C     C     C     C     C     D     M     M
8      M     M     M     D     C     C     C     C     C     D     M     E
9      E     M     M     M     D     C     C     C     D     M     M     M
0      M     M     M     D     B     M     C     C     C     D     D     D
1      M     M     M     D     M     M     C     C     D     M     M     M
2      M     M     M     D     B     D     D     D     C     D     M     M
3      M     M     M     D     C     C     C     C     C     D     M     M
4      E     E     E     D     M     C     C     C     U     M     M     M
5      E     E     E     M     D     C     C     C     U     D     M     D
6      D     D     M     D     B     M     M     C     D     D     D     D
7      D     M     D     D     M     M     C     C     C     M     M     M
8      E     E     E     D     B     M     C     C     C     D     M     E
9      E     E     E     D     B     M     C     C     C     D     M     E
0      E     E     E     D     B     M     C     D     C     D     M     M
1      M     D     M     D     M     M     C     C     C     D     M     M
        PERCENT FREQUENCY OF OCCURENCE FOR EACH CATEGORY
  A= 0.0 %  B= 4.3 %  C=27.2 %  D=24.7 %  E=11.6 %  F= 0.0 %
  U= 0.5 %  M=31.7 %
IOTE: U=UNKNOWN M=MISSING DATA
      CLOUD COVER CONDITIONS USED FROM NWS STATION  AT BUTTE
      WIND DATA TAKEN AT SITE
```

# ACOUSTIC RADAR ANALYSIS

DEER LODGE VALLEY DISPERSION STUDY MONTH OF SEPT. 1978

## ************************ FIRST INVERSION ************************************

| DAY | 0000-0600 MST | | | 0601-1200 MST | | | 1201-1800 MST | | | 1801-2400 MST | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * |
| 1 | 0 | 1 | 4 | N | N | N | N | N | N | 0 | 1 | 4 |
| 2 | 0 | 1 | 4 | N | N | N | N | N | N | 0 | 1 | 4 |
| 3 | 0 | 1 | 4 | N | N | N | N | N | N | 0 | 4 | 4 |
| 4 | 0 | 3 | 4 | N | N | N | N | N | N | 0 | 2 | 4 |
| 5 | 0 | 1 | 4 | N | N | N | N | N | N | 0 | 2 | 3 |
| 6 | 0 | 2 | 4 | N | N | N | N | N | N | 0 | 1 | 4 |
| 7 | 0 | 1 | 4 | N | N | N | N | N | N | N | N | N |
| 8 | N | N | N | N | N | N | N | N | N | 0 | 2 | 4 |
| 9 | 0 | 5 | 4 | N | N | N | N | N | N | 0 | 1 | 4 |
| 10 | 0 | 1 | 3 | N | N | N | N | N | N | 0 | 1 | 3 |
| 11 | 0 | 2 | 3 | N | N | N | N | N | N | 0 | 1 | 3 |
| 12 | 0 | 1 | 3 | N | N | N | N | N | N | N | N | N |
| 13 | 0 | 3 | 4 | N | N | N | N | N | N | 0 | 2 | 4 |
| 14 | 0 | 4 | 4 | N | N | N | N | N | N | 0 | 3 | 4 |
| 15 | 0 | 3 | 4 | 0 | 3 | 3 | N | N | N | N | N | N |
| 16 | N | N | N | N | N | N | N | N | N | 0 | 2 | 4 |
| 17 | 0 | 1 | 4 | N | N | N | N | N | N | 0 | 2 | 3 |
| 18 | 0 | 2 | 3 | N | N | N | N | N | N | 0 | 1 | 4 |
| 19 | 0 | 3 | 4 | N | N | N | N | N | N | 0 | 3 | 3 |
| 20 | 0 | 3 | 3 | N | N | N | N | N | N | 0 | 2 | 4 |
| 21 | 0 | 4 | 3 | N | N | N | N | N | N | 0 | 2 | 3 |
| 22 | 0 | 3 | 3 | 0 | 3 | 3 | N | N | N | N | N | N |
| 23 | 0 | 1 | 4 | N | N | N | N | N | N | 0 | 1 | 4 |
| 24 | 0 | 3 | 4 | N | N | N | N | N | N | 0 | 1 | 4 |
| 25 | 0 | 4 | 4 | N | N | N | N | N | N | 0 | 1 | 4 |
| 26 | 0 | 2 | 4 | 0 | 3 | 3 | N | N | N | 0 | 1 | 4 |
| 27 | 0 | 4 | 3 | 0 | 4 | 3 | N | N | N | 0 | 3 | 3 |
| 28 | 2 | 3 | 4 | 3 | 4 | 4 | N | N | N | 0 | 3 | 3 |
| 29 | 0 | 3 | 4 | N | N | N | N | N | N | 0 | 1 | 4 |
| 30 | 0 | 4 | 4 | N | N | N | N | N | N | N | N | N |

## ************************ SECOND INVERSION ************************************

| DAY | 0000-0600 MST | | | 0601-1200 MST | | | 1201-1800 MST | | | 1801-2400 MST | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * |
| 1 | 3 | 5 | 9 | 4 | 6 | 9 | N | N | N | N | N | N |
| 2 | 4 | 5 | 9 | N | N | N | N | N | N | N | N | N |
| 3 | N | N | N | N | N | N | N | N | N | N | N | N |
| 4 | N | N | N | N | N | N | N | N | N | N | N | N |
| 5 | N | N | N | N | N | N | N | N | N | N | N | N |
| 6 | N | N | N | N | N | N | N | N | N | N | N | N |
| 7 | 4 | 5 | 2 | N | N | N | N | N | N | N | N | N |
| 8 | N | N | N | N | N | N | N | N | N | N | N | N |
| 9 | N | N | N | N | N | N | N | N | N | N | N | N |
| 10 | N | N | N | N | N | N | N | N | N | N | N | N |
| 11 | N | N | N | N | N | N | N | N | N | N | N | N |
| 12 | N | N | N | N | N | N | 3 | 4 | 2 | 3 | 5 | 2 |
| 13 | N | N | N | N | N | N | N | N | N | N | N | N |
| 14 | N | N | N | N | N | N | N | N | N | N | N | N |
| 15 | N | N | N | N | N | N | N | N | N | N | N | N |
| 16 | N | N | N | N | N | N | N | N | N | N | N | N |
| 17 | N | N | N | N | N | N | N | N | N | N | N | N |
| 18 | N | N | N | N | N | N | N | N | N | N | N | N |
| 19 | N | N | N | N | N | N | N | N | N | N | N | N |
| 20 | N | N | N | N | N | N | N | N | N | N | N | N |
| 21 | N | N | N | N | N | N | N | N | N | N | N | N |
| 22 | N | N | N | N | N | N | N | N | N | 3 | 6 | 9 |
| 23 | 2 | 4 | 2 | 1 | 3 | 2 | N | N | N | N | N | N |
| 24 | N | N | N | N | N | N | N | N | N | N | N | N |
| 25 | N | N | N | N | N | N | N | N | N | N | N | N |
| 26 | N | N | N | N | N | N | N | N | N | N | N | N |
| 27 | N | N | N | N | N | N | N | N | N | N | N | N |
| 28 | N | N | N | N | N | N | N | N | N | N | N | N |
| 29 | N | N | N | N | N | N | N | N | N | N | N | N |
| 30 | N | N | N | N | N | N | N | N | N | N | N | N |

NOTE: FOR TYPE 1=FRONTAL,2=SUBSIDENCE,3=RADIATION (SPIKED ECHO)
4=RADIATION (LAMINAR ECHO) 9=UNKNOWN
N=NO INVERSION M=MISSING DATA OR UNKNOWN

```
                         ACOUSTIC RADAR ANALYSIS

ER LODGE VALLEY DISPERSION STUDY          MONTH OF SEPT.    1978

    ******* FIRST INVERSION FREQUENCY OF OCCURENCE TABLE *******

ICKNESS         INVERSION BASE HEIGHT (IN METERS)
METERS)  SFC    100    200    300    400    500    600    700    800    900    TOTAL

-TIME     0- 600 MST ------------------------------------------------------------------

01-100     9      0      1      0      0      0      0      0      0      0      10
01-300    12      0      0      0      0      0      0      0      0      0      12
01-500     6      0      0      0      0      0      0      0      0      0       6
01-900     0      0      0      0      0      0      0      0      0      0       0
 INVERSION                                                                       2

TOTAL     27      0      1      0      0      0      0      0      0      0      30

-TIME   601-1200 MST ------------------------------------------------------------------

01-100     0      0      0      1      0      0      0      0      0      0       1
01-300     3      0      0      0      0      0      0      0      0      0       3
01-500     1      0      0      0      0      0      0      0      0      0       1
01-900     0      0      0      0      0      0      0      0      0      0       0
 INVERSION                                                                      25

TOTAL      4      0      0      1      0      0      0      0      0      0      30

-TIME  1201-1800 MST ------------------------------------------------------------------

01-100     0      0      0      0      0      0      0      0      0      0       0
01-300     0      0      0      0      0      0      0      0      0      0       0
01-500     0      0      0      0      0      0      0      0      0      0       0
01-900     0      0      0      0      0      0      0      0      0      0       0
 INVERSION                                                                      30

TOTAL      0      0      0      0      0      0      0      0      0      0      30

-TIME  1801-2400 MST ------------------------------------------------------------------

01-100    12      0      0      0      0      0      0      0      0      0      12
01-300    12      0      0      0      0      0      0      0      0      0      12
01-500     1      0      0      0      0      0      0      0      0      0       1
01-900     0      0      0      0      0      0      0      0      0      0       0
 INVERSION                                                                       5

TOTAL     25      0      0      0      0      0      0      0      0      0      30


-------------- FREQUENCY SUMMARY FOR FIRST INVERSION -----------------------------------

01-100    21      0      1      1      0      0      0      0      0      0      23
01-300    27      0      0      0      0      0      0      0      0      0      27
01-500     8      0      0      0      0      0      0      0      0      0       8
01-900     0      0      0      0      0      0      0      0      0      0       0
 INVERSION                                                                      62

TOTAL     56      0      1      1      0      0      0      0      0      0     120
```

```
                          ACOUSTIC RADAR ANALYSIS
DEER LODGE VALLEY DISPERSION STUDY          MONTH OF SEPT.    1978
      ******* SECOND INVERSION FREQUENCY OF OCCURENCE TABLE ******
THICKNESS          INVERSION BASE HEIGHT (IN METERS)
 (METERS)   SFC   100   200   300   400   500   600   700   800   900   TOTAL
---TIME    0- 600 MST ---------------------------------------------------------
 001-100     0     0     0     0     2     0     0     0     0     0       2
 101-300     0     0     1     1     0     0     0     0     0     0       2
 301-500     0     0     0     0     0     0     0     0     0     0       0
 501-900     0     0     0     0     0     0     0     0     0     0       0
NO INVERSION                                                              26
  TOTAL      0     0     1     1     2     0     0     0     0     0      30
---TIME  601-1200 MST ---------------------------------------------------------
 001-100     0     0     0     0     0     0     0     0     0     0       0
 101-300     0     1     0     0     1     0     0     0     0     0       2
 301-500     0     0     0     0     0     0     0     0     0     0       0
 501-900     0     0     0     0     0     0     0     0     0     0       0
NO INVERSION                                                              28
  TOTAL      0     1     0     0     1     0     0     0     0     0      30
---TIME 1201-1800 MST ---------------------------------------------------------
 001-100     0     0     0     1     0     0     0     0     0     0       1
 101-300     0     0     0     0     0     0     0     0     0     0       0
 301-500     0     0     0     0     0     0     0     0     0     0       0
 501-900     0     0     0     0     0     0     0     0     0     0       0
NO INVERSION                                                              29
  TOTAL      0     0     0     1     0     0     0     0     0     0      30
---TIME 1801-2400 MST ---------------------------------------------------------
 001-100     0     0     0     0     0     0     0     0     0     0       0
 101-300     0     0     0     2     0     0     0     0     0     0       2
 301-500     0     0     0     0     0     0     0     0     0     0       0
 501-900     0     0     0     0     0     0     0     0     0     0       0
NO INVERSION                                                              28
  TOTAL      0     0     0     2     0     0     0     0     0     0      30

----------------- FREQUENCY SUMMARY FOR SECOND INVERSION -----------------------
 001-100     0     0     0     1     2     0     0     0     0     0       3
 101-300     0     1     1     3     1     0     0     0     0     0       6
 301-500     0     0     0     0     0     0     0     0     0     0       0
 501-900     0     0     0     0     0     0     0     0     0     0       0
NO INVERSION                                                             111
  TOTAL      0     1     1     4     3     0     0     0     0     0     120
```

```
                    ACOUSTIC RADAR ANALYSIS
R LODGE VALLEY DISPERSION STUDY          MONTH OF SEPT.    1978

****** TWO HOUR STABILITY ANALYSIS ***************************

   ---------------------- HOUR ----------------------------------
  02    04    06    08    10    12    14    16    18    20    22    24
   M     M     D     C     C     C     M     C     C     M     M     E
   E     E     E     C     D     C     C     C     D     M     M     E
   E     E     M     M     D     C     D     C     C     D     M     M
   M     M     M     M     D     D     C     C     C     M     E     E
   M     M     M     D     D     D     D     D     D     E     D     M
   D     D     D     D     C     C     C     C     C     D     M     M
   M     M     D     D     B     B     C     C     D     D     D     D
   D     D     D     D     C     C     C     C     D     E     M     M
   M     M     M     M     D     C     C     C     D     D     M     M
   E     E     E     E     D     C     D     D     D     D     E     E
   E     E     E     E     D     D     D     D     D     E     E     E
   E     E     D     D     D     D     C     C     C     D     D     M
   M     M     M     D     B     C     C     C     C     D     E     M
   M     E     E     M     B     D     M     B     C     D     M     M
   M     M     M     D     D     C     C     C     D     D     D     D
   D     D     D     D     C     C     C     C     C     D     M     M
   M     M     M     M     D     M     M     C     C     E     M     M
   M     M     M     D     D     D     D     D     D     M     M     M
   M     M     M     M     B     D     D     C     C     E     M     M
   M     M     M     D     C     C     C     C     C     M     M     M
   M     M     M     M     D     C     C     C     D     E     E     E
   M     M     M     M     D     C     C     C     D     D     D     M
   M     M     M     M     D     M     M     C     D     M     E     E
   E     E     E     M     D     B     C     C     D     M     E     E
   E     M     E     D     C     C     C     C     D     M     E     E
   E     E     E     M     D     C     C     C     D     M     E     E
   M     M     E     M     D     C     C     D     D     M     M     M
   M     D     D     D     D     D     M     D     D     M     M     M
   M     M     M     D     C     C     M     C     C     D     E     E
   M     M     M     M     D     C     C     C     D     D     D     D
      PERCENT FREQUENCY OF OCCURENCE FOR EACH CATEGORY
 A= 0.0 %  B= 1.9 %  C=22.2 %  D=29.4 %  E=14.7 %  F= 0.0 %
 U= 0.0 %  M=31.7 %

E: U=UNKNOWN M=MISSING DATA
   CLOUD COVER CONDITIONS USED FROM NWS STATION  AT BUTTE
   WIND DATA TAKEN AT SITE
```

# ACOUSTIC RADAR ANALYSIS

DEER LODGE VALLEY DISPERSION STUDY MONTH OF OCTOBER 1978

## FIRST INVERSION

| DAY | 0000-0600 MST | | | 0601-1200 MST | | | 1201-1800 MST | | | 1801-2400 MST | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * |
| 1 | N | N | N | N | N | N | N | N | N | N | N | N |
| 2 | 0 | 2 | 4 | N | N | N | N | N | N | 0 | 1 | 4 |
| 3 | 0 | 3 | 4 | 0 | 3 | 3 | N | N | N | N | N | N |
| 4 | 0 | 3 | 4 | N | N | N | N | N | N | 0 | 1 | 4 |
| 5 | 0 | 1 | 4 | N | N | N | N | N | N | 0 | 1 | 4 |
| 6 | 0 | 2 | 4 | 1 | 2 | 4 | N | N | N | 0 | 1 | 4 |
| 7 | 0 | 4 | 4 | 1 | 4 | 4 | N | N | N | 0 | 1 | 3 |
| 8 | 0 | 2 | 3 | 1 | 4 | 9 | N | N | N | 0 | 1 | 4 |
| 9 | 0 | 4 | 4 | 1 | 4 | 4 | N | N | N | 0 | 1 | 3 |
| 10 | 0 | 3 | 3 | N | N | N | N | N | N | N | N | N |
| 11 | N | N | N | N | N | N | N | N | N | N | N | N |
| 12 | N | N | N | N | N | N | N | N | N | 0 | 1 | 4 |
| 13 | 0 | 1 | 4 | 2 | 4 | 4 | N | N | N | 0 | 1 | 4 |
| 14 | 0 | 1 | 4 | 1 | 3 | 4 | N | N | N | 0 | 1 | 4 |
| 15 | 0 | 4 | 4 | 1 | 4 | 4 | N | N | N | 0 | 1 | 4 |
| 16 | 0 | 3 | 4 | 1 | 4 | 4 | N | N | N | 0 | 1 | 3 |
| 17 | 0 | 3 | 3 | 2 | 4 | 4 | N | N | N | N | N | N |
| 18 | 0 | 1 | 4 | 1 | 4 | 3 | N | N | N | 0 | 3 | 4 |
| 19 | 0 | 5 | 4 | N | N | N | N | N | N | 0 | 3 | 3 |
| 20 | 0 | 3 | 3 | N | N | N | N | N | N | N | N | N |
| 21 | N | N | N | N | N | N | N | N | N | 0 | 3 | 4 |
| 22 | 0 | 2 | 4 | 1 | 4 | 4 | N | N | N | 0 | 3 | 3 |
| 23 | 0 | 2 | 3 | N | N | N | N | N | N | 0 | 2 | 3 |
| 24 | 0 | 2 | 3 | N | N | N | N | N | N | 0 | 2 | 3 |
| 25 | 0 | 3 | 4 | 0 | 4 | 4 | 3 | 5 | 4 | 0 | 2 | 4 |
| 26 | 0 | 3 | 4 | 0 | 1 | 4 | N | N | N | 0 | 1 | 4 |
| 27 | 0 | 2 | 4 | 0 | 2 | 4 | N | N | N | N | N | N |
| 28 | N | N | N | N | N | N | N | N | N | 0 | 2 | 4 |
| 29 | N | N | N | N | N | N | N | N | N | 0 | 1 | 4 |
| 30 | 0 | 2 | 4 | N | N | N | N | N | N | 0 | 2 | 4 |
| 31 | 0 | 5 | 4 | 2 | 6 | 4 | N | N | N | 0 | 3 | 4 |

## SECOND INVERSION

| DAY | 0000-0600 MST | | | 0601-1200 MST | | | 1201-1800 MST | | | 1801-2400 MST | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * |
| 1 | N | N | N | N | N | N | N | N | N | N | N | N |
| 2 | N | N | N | N | N | N | N | N | N | N | N | N |
| 3 | N | N | N | N | N | N | N | N | N | N | N | N |
| 4 | N | N | N | N | N | N | N | N | N | N | N | N |
| 5 | N | N | N | N | N | N | N | N | N | N | N | N |
| 6 | N | N | N | N | N | N | N | N | N | N | N | N |
| 7 | N | N | N | N | N | N | N | N | N | N | N | N |
| 8 | N | N | N | N | N | N | N | N | N | N | N | N |
| 9 | N | N | N | N | N | N | N | N | N | N | N | N |
| 10 | N | N | N | N | N | N | N | N | N | N | N | N |
| 11 | N | N | N | N | N | N | N | N | N | N | N | N |
| 12 | N | N | N | N | N | N | N | N | N | N | N | N |
| 13 | N | N | N | N | N | N | N | N | N | N | N | N |
| 14 | N | N | N | N | N | N | N | N | N | N | N | N |
| 15 | N | N | N | N | N | N | N | N | N | N | N | N |
| 16 | N | N | N | N | N | N | N | N | N | N | N | N |
| 17 | N | N | N | N | N | N | N | N | N | N | N | N |
| 18 | 7 | 8 | 2 | N | N | N | N | N | N | N | N | N |
| 19 | N | N | N | N | N | N | N | N | N | N | N | N |
| 20 | N | N | N | N | N | N | N | N | N | N | N | N |
| 21 | N | N | N | N | N | N | N | N | N | N | N | N |
| 22 | N | N | N | N | N | N | N | N | N | N | N | N |
| 23 | N | N | N | N | N | N | N | N | N | N | N | N |
| 24 | N | N | N | N | N | N | N | N | N | N | N | N |
| 25 | N | N | N | N | N | N | N | N | N | N | N | N |
| 26 | N | N | N | N | N | N | N | N | N | N | N | N |
| 27 | N | N | N | N | N | N | N | N | N | 2 | 5 | 9 |
| 28 | 3 | 5 | 9 | N | N | N | N | N | N | N | N | N |
| 29 | 2 | 5 | 9 | N | N | N | N | N | N | N | N | N |
| 30 | N | N | N | N | N | N | N | N | N | N | N | N |
| 31 | N | N | N | N | N | N | 2 | 4 | 9 | N | N | N |

NOTE: FOR TYPE 1=FRONTAL,2=SUBSIDENCE,3=RADIATION (SPIKED ECHO)
4=RADIATION (LAMINAR ECHO) 9=UNKNOWN
N=NO INVERSION, M=MISSING DATA OR UNKNOWN

```
                      ACOUSTIC RADAR ANALYSIS
ER LODGE VALLEY DISPERSION STUDY          MONTH OF OCTOBER  1978
     ******* FIRST INVERSION FREQUENCY OF OCCURENCE TABLE *******
ICKNESS        INVERSION BASE HEIGHT (IN METERS)
METERS)  SFC    100    200    300    400    500    600    700    800    900    TOTAL
-TIME    0- 600 MST -----------------------------------------------------------------
01-100     4      0      0      0      0      0      0      0      0      0        4
01-300    16      0      0      0      0      0      0      0      0      0       16
01-500     5      0      0      0      0      0      0      0      0      0        5
01-900     0      0      0      0      0      0      0      0      0      0        0
 INVERSION                                                                         6

TOTAL     25      0      0      0      0      0      0      0      0      0       31
-TIME  601-1200 MST -----------------------------------------------------------------
01-100     1      1      0      0      0      0      0      0      0      0        2
01-300     2      8      2      0      0      0      0      0      0      0       12
01-500     1      0      1      0      0      0      0      0      0      0        2
01-900     0      0      0      0      0      0      0      0      0      0        0
 INVERSION                                                                        15

TOTAL      4      9      3      0      0      0      0      0      0      0       31
-TIME 1201-1800 MST -----------------------------------------------------------------
01-100     0      0      0      0      0      0      0      0      0      0        0
01-300     0      0      0      1      0      0      0      0      0      0        1
01-500     0      0      0      0      0      0      0      0      0      0        0
01-900     0      0      0      0      0      0      0      0      0      0        0
 INVERSION                                                                        30

TOTAL      0      0      0      1      0      0      0      0      0      0       31
-TIME 1801-2400 MST -----------------------------------------------------------------
01-100    14      0      0      0      0      0      0      0      0      0       14
01-300    10      0      0      0      0      0      0      0      0      0       10
01-500     0      0      0      0      0      0      0      0      0      0        0
01-900     0      0      0      0      0      0      0      0      0      0        0
 INVERSION                                                                         7

TOTAL     24      0      0      0      0      0      0      0      0      0       31

-------------- FREQUENCY SUMMARY FOR FIRST INVERSION --------------------------------

01-100    19      1      0      0      0      0      0      0      0      0       20
01-300    28      8      2      1      0      0      0      0      0      0       39
01-500     6      0      1      0      0      0      0      0      0      0        7
01-900     0      0      0      0      0      0      0      0      0      0        0
 INVERSION                                                                        58

TOTAL     53      9      3      1      0      0      0      0      0      0      124
```

```
                              ACOUSTIC RADAR ANALYSIS
 DEER LODGE VALLEY DISPERSION STUDY             MONTH OF OCTOBER  1978
       ******* SECOND INVERSION FREQUENCY OF OCCURENCE TABLE ******
 THICKNESS           INVERSION BASE HEIGHT (IN METERS)
 (METERS)   SFC    100    200    300    400    500    600    700    800    900    TOTAL
 ---TIME    0- 600 MST -------------------------------------------------------------------
  001-100    0      0      0      0      0      0      0      1      0      0        1
  101-300    0      0      1      1      0      0      0      0      0      0        2
  301-500    0      0      0      0      0      0      0      0      0      0        0
  501-900    0      0      0      0      0      0      0      0      0      0        0
 NO INVERSION                                                                       28
   TOTAL     0      0      1      1      0      0      0      1      0      0       31
 ---TIME  601-1200 MST -------------------------------------------------------------------
  001-100    0      0      0      0      0      0      0      0      0      0        0
  101-300    0      0      0      0      0      0      0      0      0      0        0
  301-500    0      0      0      0      0      0      0      0      0      0        0
  501-900    0      0      0      0      0      0      0      0      0      0        0
 NO INVERSION                                                                       31
   TOTAL     0      0      0      0      0      0      0      0      0      0       31
 ---TIME 1201-1800 MST -------------------------------------------------------------------
  001-100    0      0      0      0      0      0      0      0      0      0        0
  101-300    0      0      1      0      0      0      0      0      0      0        1
  301-500    0      0      0      0      0      0      0      0      0      0        0
  501-900    0      0      0      0      0      0      0      0      0      0        0
 NO INVERSION                                                                       30
   TOTAL     0      0      1      0      0      0      0      0      0      0       31
 ---TIME 1801-2400 MST -------------------------------------------------------------------
  001-100    0      0      0      0      0      0      0      0      0      0        0
  101-300    0      0      1      0      0      0      0      0      0      0        1
  301-500    0      0      0      0      0      0      0      0      0      0        0
  501-900    0      0      0      0      0      0      0      0      0      0        0
 NO INVERSION                                                                       30
   TOTAL     0      0      1      0      0      0      0      0      0      0       31

 ------------------ FREQUENCY SUMMARY FOR SECOND INVERSION -------------------------------
  001-100    0      0      0      0      0      0      0      1      0      0        1
  101-300    0      0      3      1      0      0      0      0      0      0        4
  301-500    0      0      0      0      0      0      0      0      0      0        0
  501-900    0      0      0      0      0      0      0      0      0      0        0
 NO INVERSION                                                                      119
   TOTAL     0      0      3      1      0      0      0      1      0      0      124
```

```
                         ACOUSTIC RADAR ANALYSIS
R LODGE VALLEY DISPERSION STUDY            MONTH OF OCTOBER  1978


****** TWO HOUR STABILITY ANALYSIS ***************************
   ----------------------- HOUR ---------------------------------
   02    04    06    08    10    12    14    16    18    20    22    24
    D     D     D     D     C     C     C     C     D     D     D     E
    M     M     M     D     C     C     C     C     C     M     E     E
    M     M     M     M     D     C     C     C     D     D     D     M
    M     M     M     M     D     C     C     C     D     M     E     E
    E     M     M     M     D     B     C     C     D     M     E     E
    E     M     M     M     D     B     C     C     D     M     E     E
    E     M     M     M     D     C     C     C     D     M     M     M
    M     E     M     D     C     C     C     C     C     D     E     E
    E     M     M     M     D     C     C     C     D     D     M     M
    M     M     M     D     C     C     C     C     D     D     D     D
    D     D     D     D     C     C     C     C     D     D     D     D
    D     D     D     D     C     C     C     C     C     M     M     M
    M     M     M     M     B     D     C     C     D     M     M     E
    M     M     M     M     B     C     C     D     D     M     M     E
    E     M     E     M     D     C     C     C     D     M     E     E
    M     M     M     M     B     D     C     C     D     D     M     M
    M     E     E     M     B     D     C     C     D     D     D     M
    M     M     E     M     C     D     C     C     D     M     E     E
    M     E     E     M     D     C     C     D     D     M     E     M
    E     E     E     D     D     C     C     C     D     D     D     D
    D     D     D     D     D     C     C     C     D     M     M     M
    M     M     M     E     D     C     C     C     D     M     M     M
    E     E     E     D     C     C     C     D     D     E     E     E
    E     D     D     D     C     C     C     D     D     E     M     M
    M     M     M     M     M     C     C     C     D     M     M     M
    M     M     E     M     M     D     C     C     B     M     M     M
    M     E     M     M     D     C     C     C     D     D     D     D
    D     D     M     M     D     C     C     C     D     M     M     E
    D     D     D     D     C     C     C     C     D     E     M     M
    M     M     M     M     D     C     C     C     D     M     E     E
    E     M     M     M     C     D     C     C     D     M     M     M
      PERCENT FREQUENCY OF OCCURENCE FOR EACH CATEGORY
 A= 0.0 %  B= 1.9 %  C=25.5 %  D=27.4 %  E=13.2 %  F= 0.0 %

 U= 0.0 %  M=32.0 %

E: U=UNKNOWN M=MISSING DATA
   CLOUD COVER CONDITIONS USED FROM NWS STATION  AT BUTTE
   WIND DATA TAKEN AT SITE
```

# ACOUSTIC RADAR ANALYSIS

DEER LODGE VALLEY DISPERSION STUDY        MONTH OF NOVEMBER 1978

### FIRST INVERSION

| DAY | 0000-0600 MST |  |  | 0601-1200 MST |  |  | 1201-1800 MST |  |  | 1801-2400 MST |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * |
| 1 | 0 | 4 | 4 | 0 | 4 | 4 | N | N | N | 0 | 2 | 4 |
| 2 | 0 | 4 | 4 | 0 | 4 | 4 | N | N | N | 0 | 2 | 4 |
| 3 | 0 | 3 | 4 | 0 | 3 | 4 | N | N | N | 0 | 2 | 3 |
| 4 | N | N | N | N | N | N | N | N | N | N | N | N |
| 5 | N | N | N | N | N | N | N | N | N | 0 | 4 | 4 |
| 6 | 0 | 2 | 4 | N | N | N | N | N | N | 0 | 2 | 4 |
| 7 | 0 | 2 | 3 | N | N | N | N | N | N | 0 | 2 | 3 |
| 8 | 0 | 2 | 3 | 2 | 4 | 9 | N | N | N | 0 | 2 | 3 |
| 9 | N | N | N | N | N | N | N | N | N | N | N | N |
| 10 | N | N | N | N | N | N | N | N | N | N | N | N |
| 11 | N | N | N | N | N | N | N | N | N | N | N | N |
| 12 | N | N | N | N | N | N | N | N | N | N | N | N |
| 13 | N | N | N | N | N | N | N | N | N | 0 | 1 | 4 |
| 14 | 0 | 2 | 4 | 0 | 3 | 4 | N | N | N | 0 | 1 | 4 |
| 15 | 0 | 3 | 4 | 0 | 4 | 4 | N | N | N | 0 | 5 | 4 |
| 16 | 0 | 3 | 4 | N | N | N | N | N | N | 0 | 1 | 3 |
| 17 | 0 | 2 | 3 | N | N | N | N | N | N | 0 | 4 | 3 |
| 18 | N | N | N | N | N | N | N | N | N | N | N | N |
| 19 | N | N | N | N | N | N | N | N | N | N | N | N |
| 20 | 0 | 1 | 4 | 0 | 1 | 4 | N | N | N | N | N | N |
| 21 | 0 | 3 | 4 | 0 | 4 | 4 | 0 | 5 | 4 | 0 | 5 | 4 |
| 22 | 0 | 5 | 4 | 0 | 5 | 4 | 0 | 5 | 4 | 0 | 5 | 4 |
| 23 | 0 | 4 | 4 | 0 | 4 | 4 | 0 | 4 | 4 | 0 | 1 | 4 |
| 24 | 0 | 1 | 4 | 0 | 4 | 4 | 0 | 3 | 4 | 0 | 1 | 4 |
| 25 | 0 | 2 | 4 | N | N | N | N | N | N | 2 | 6 | 9 |
| 26 | 0 | 3 | 4 | 0 | 3 | 4 | N | N | N | 0 | 3 | 4 |
| 27 | 0 | 5 | 4 | 0 | 5 | 4 | 0 | 5 | 3 | 0 | 3 | 3 |
| 28 | 0 | 5 | 3 | N | N | N | N | N | N | 0 | 2 | 4 |
| 29 | 0 | 3 | 3 | 0 | 3 | 3 | 0 | 3 | 4 | 0 | 3 | 4 |
| 30 | 0 | 4 | 4 | N | N | N | N | N | N | 0 | 2 | 4 |

### SECOND INVERSION

| DAY | 0000-0600 MST |  |  | 0601-1200 MST |  |  | 1201-1800 MST |  |  | 1801-2400 MST |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * |
| 1 | N | N | N | N | N | N | N | N | N | N | N | N |
| 2 | N | N | N | N | N | N | N | N | N | N | N | N |
| 3 | N | N | N | N | N | N | N | N | N | N | N | N |
| 4 | N | N | N | N | N | N | N | N | N | N | N | N |
| 5 | N | N | N | N | N | N | N | N | N | N | N | N |
| 6 | N | N | N | N | N | N | N | N | N | N | N | N |
| 7 | N | N | N | N | N | N | N | N | N | N | N | N |
| 8 | N | N | N | N | N | N | N | N | N | N | N | N |
| 9 | N | N | N | N | N | N | N | N | N | N | N | N |
| 10 | N | N | N | N | N | N | N | N | N | N | N | N |
| 11 | N | N | N | N | N | N | N | N | N | N | N | N |
| 12 | N | N | N | N | N | N | N | N | N | N | N | N |
| 13 | N | N | N | N | N | N | N | N | N | N | N | N |
| 14 | N | N | N | N | N | N | 3 | 5 | 4 | N | N | N |
| 15 | N | N | N | N | N | N | 2 | 4 | 4 | N | N | N |
| 16 | N | N | N | 1 | 2 | 3 | N | N | N | N | N | N |
| 17 | N | N | N | 1 | 2 | 3 | N | N | N | N | N | N |
| 18 | N | N | N | 1 | 2 | 4 | 3 | 5 | 4 | N | N | N |
| 19 | N | N | N | N | N | N | N | N | N | N | N | N |
| 20 | N | N | N | N | N | N | N | N | N | 2 | 3 | 9 |
| 21 | N | N | N | N | N | N | N | N | N | N | N | N |
| 22 | N | N | N | N | N | N | N | N | N | N | N | N |
| 23 | N | N | N | N | N | N | N | N | N | 4 | 7 | 9 |
| 24 | 3 | 4 | 9 | N | N | N | N | N | N | 3 | 6 | 9 |
| 25 | 3 | 5 | 9 | 3 | 6 | 9 | N | N | N | N | N | N |
| 26 | N | N | N | N | N | N | N | N | N | 2 | 6 | 9 |
| 27 | N | N | N | N | N | N | N | N | N | N | N | N |
| 28 | N | N | N | N | N | N | N | N | N | N | N | N |
| 29 | N | N | N | N | N | N | N | N | N | N | N | N |
| 30 | N | N | N | N | N | N | N | N | N | N | N | N |

NOTE: FOR TYPE 1=FRONTAL,2=SUBSIDENCE,3=RADIATION (SPIKED ECHO)
4=RADIATION (LAMINAR ECHO) 9=UNKNOWN
N=NO INVERSION M=MISSING DATA OR UNKNOWN

```
                     ACOUSTIC RADAR ANALYSIS
ER LODGE VALLEY DISPERSION STUDY          MONTH OF NOVEMBER 1978
     ******* FIRST INVERSION FREQUENCY OF OCCURENCE TABLE *******
ICKNESS         INVERSION BASE HEIGHT (IN METERS)
METERS)  SFC   100   200   300   400   500   600   700   800   900   TOTAL
-TIME     0- 600 MST ----------------------------------------------------------
01-100      2     0     0     0     0     0     0     0     0     0     2
01-300     12     0     0     0     0     0     0     0     0     0    12
01-500      7     0     0     0     0     0     0     0     0     0     7
01-900      0     0     0     0     0     0     0     0     0     0     0
 INVERSION                                                              9
TOTAL      21     0     0     0     0     0     0     0     0     0    30
-TIME  601-1200 MST ----------------------------------------------------------
01-100      1     0     0     0     0     0     0     0     0     0     1
01-300      4     0     1     0     0     0     0     0     0     0     5
01-500      8     0     0     0     0     0     0     0     0     0     8
01-900      0     0     0     0     0     0     0     0     0     0     0
 INVERSION                                                             16
TOTAL      13     0     1     0     0     0     0     0     0     0    30
-TIME 1201-1800 MST ----------------------------------------------------------
01-100      0     0     0     0     0     0     0     0     0     0     0
01-300      2     0     0     0     0     0     0     0     0     0     2
01-500      4     0     0     0     0     0     0     0     0     0     4
01-900      0     0     0     0     0     0     0     0     0     0     0
 INVERSION                                                             24
TOTAL       6     0     0     0     0     0     0     0     0     0    30
-TIME 1801-2400 MST ----------------------------------------------------------
01-100      5     0     0     0     0     0     0     0     0     0     5
01-300     11     0     0     0     0     0     0     0     0     0    11
01-500      5     0     1     0     0     0     0     0     0     0     6
01-900      0     0     0     0     0     0     0     0     0     0     0
 INVERSION                                                              8
TOTAL      21     0     1     0     0     0     0     0     0     0    30

-------------- FREQUENCY SUMMARY FOR FIRST INVERSION -----------------------
01-100      8     0     0     0     0     0     0     0     0     0     8
01-300     29     0     1     0     0     0     0     0     0     0    30
01-500     24     0     1     0     0     0     0     0     0     0    25
01-900      0     0     0     0     0     0     0     0     0     0     0
 INVERSION                                                             57
TOTAL      61     0     2     0     0     0     0     0     0     0   120
```

```
                          ACOUSTIC RADAR ANALYSIS
DEER LODGE VALLEY DISPERSION STUDY          MONTH OF NOVEMBER 1978
      ******* SECOND INVERSION FREQUENCY OF OCCURENCE TABLE ******
THICKNESS          INVERSION BASE HEIGHT (IN METERS)
 (METERS)  SFC    100    200    300    400    500    600    700    800    900    TOTAL
---TIME    0- 600 MST -----------------------------------------------------------------

 001-100    0      0      0      1      0      0      0      0      0      0        1
 101-300    0      0      0      1      0      0      0      0      0      0        1
 301-500    0      0      0      0      0      0      0      0      0      0        0
 501-900    0      0      0      0      0      0      0      0      0      0        0
NO INVERSION                                                                        28

  TOTAL     0      0      0      2      0      0      0      0      0      0       30
---TIME  601-1200 MST -----------------------------------------------------------------

 001-100    0      3      0      0      0      0      0      0      0      0        3
 101-300    0      0      0      1      0      0      0      0      0      0        1
 301-500    0      0      0      0      0      0      0      0      0      0        0
 501-900    0      0      0      0      0      0      0      0      0      0        0
NO INVERSION                                                                        26

  TOTAL     0      3      0      1      0      0      0      0      0      0       30
---TIME 1201-1800 MST -----------------------------------------------------------------

 001-100    0      0      0      0      0      0      0      0      0      0        0
 101-300    0      0      1      2      0      0      0      0      0      0        3
 301-500    0      0      0      0      0      0      0      0      0      0        0
 501-900    0      0      0      0      0      0      0      0      0      0        0
NO INVERSION                                                                        27

  TOTAL     0      0      1      2      0      0      0      0      0      0       30
---TIME 1801-2400 MST -----------------------------------------------------------------

 001-100    0      0      1      0      0      0      0      0      0      0        1
 101-300    0      0      0      1      1      0      0      0      0      0        2
 301-500    0      0      1      0      0      0      0      0      0      0        1
 501-900    0      0      0      0      0      0      0      0      0      0        0
NO INVERSION                                                                        26

  TOTAL     0      0      2      1      1      0      0      0      0      0       30

----------------- FREQUENCY SUMMARY FOR SECOND INVERSION -------------------------------

 001-100    0      3      1      1      0      0      0      0      0      0        5
 101-300    0      0      1      5      1      0      0      0      0      0        7
 301-500    0      0      1      0      0      0      0      0      0      0        1
 501-900    0      0      0      0      0      0      0      0      0      0        0
NO INVERSION                                                                       107

  TOTAL     0      3      3      6      1      0      0      0      0      0      120
```

```
                         ACOUSTIC RADAR ANALYSIS
ER LODGE VALLEY DISPERSION STUDY          MONTH OF NOVEMBER 1978

****** TWO HOUR STABILITY ANALYSIS ***************************
     ---------------------- HOUR -------------------------------
/   02    04    06    08    10    12    14    16    18    20    22    24
     M     M     M     M     M     M     M     D     M     E     E     E
     M     E     M     M     D     C     C     D     D     M     M     M
     M     M     M     M     M     D     D     D     D     E     E     E
     D     D     D     D     D     D'    D     D     D     D     D     D
     D     D     E     E     D     C     C     C     D     M     M     M
     M     M     M     M     D     C     C     M     M     M     E     E
     E     E     E     E     E     D     C     C     C     E     E     E
     E     M     M     E     D     C     C     C     C     E     E     M
     D     D     D     D     C     D     C     C     C     D     C     D
     D     D     D     D     D     C     C     C     D     D     D     D
     D     D     D     D     B     C     C     C     C     D     D     D
     D     D     D     D     C     C     C     C     D     D     D     D
     D     D     D     D     B     B     B     E     M     M     M     M
     M     M     M     M     M     D     C     C     D     M     M     M
     M     M     M     M     M     D     B     B     M     M     M     M
     M     M     M     D     C     C     C     D     E     M     M     E
     E     E     E     D     C     C     D     D     D     D     E     M
     D     D     M     M     D     B     D     D     D     D     D     D
     D     D     D     D     D     D     D     D     D     D     D     D
     D     M     M     M     D     B     B     D     D     D     D     D
     D     M     M     M     M     M     M     M     M     M     M     M
     M     M     M     M     M     M     M     M     M     M     M     M
     M     M     M     M     M     M     M     M     M     M     M     M
     M     M     M     M     M     M     M     M     M     M     M     M
     M     M     M     M     D     D     B     B     D     D     D     D
     M     M     M     M     M     D     C     C     D     D     M     M
     M     M     M     M     M     M     M     M     M     E     E     E
     E     E     E     D     D     D     D     D     D     E     M     M
     E     M     M     M     M     E     E     M     M     M     M     M
     M     M     D     D     D     C     D     C     M     M     M     M
       PERCENT FREQUENCY OF OCCURENCE FOR EACH CATEGORY
 A= 0.0 %  B= 3.3 %  C=11.1 %  D=33.6 %  E=10.8 %  F= 0.0 %
 U= 0.0 %  M=41.1 %
E: U=UNKNOWN M=MISSING DATA
    CLOUD COVER CONDITIONS USED FROM NWS STATION  AT BUTTE
    WIND DATA TAKEN AT SITE
```

# ACOUSTIC RADAR ANALYSIS

DEER LODGE VALLEY DISPERSION STUDY MONTH OF DECEMBER 1978

************************ FIRST INVERSION ************************************

| DAY | 0000-0600 MST | | | 0601-1200 MST | | | 1201-1800 MST | | | 1801-2400 MST | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * |
| 1 | 0 | 3 | 4 | 2 | 4 | 4 | 0 | 2 | 4 | N | N | N |
| 2 | 0 | 1 | 4 | 0 | 1 | 4 | 1 | 5 | 4 | 0 | 3 | 4 |
| 3 | 0 | 2 | 4 | N | N | N | N | N | N | N | N | N |
| 4 | N | N | N | N | N | N | N | N | N | 0 | 1 | 3 |
| 5 | 0 | 2 | 4 | 0 | 2 | 4 | 0 | 3 | 4 | 0 | 2 | 4 |
| 6 | 0 | 2 | 4 | 0 | 2 | 4 | 0 | 1 | 4 | 0 | 1 | 4 |
| 7 | 0 | 2 | 4 | 0 | 3 | 4 | 1 | 3 | 4 | 0 | 2 | 4 |
| 8 | 0 | 3 | 3 | 0 | 3 | 3 | 0 | 4 | 4 | 0 | 5 | 4 |
| 9 | 0 | 4 | 3 | 0 | 3 | 3 | N | N | N | 0 | 3 | 3 |
| 10 | 0 | 2 | 3 | 0 | 2 | 3 | 1 | 2 | 3 | 0 | 3 | 3 |
| 11 | 0 | 3 | 3 | N | N | N | N | N | N | 0 | 3 | 3 |
| 12 | 0 | 1 | 3 | 0 | 2 | 3 | N | N | N | 0 | 2 | 4 |
| 13 | 0 | 5 | 4 | 0 | 5 | 4 | 2 | 5 | 4 | 0 | 3 | 4 |
| 14 | 0 | 3 | 3 | 0 | 3 | 3 | N | N | N | 0 | 2 | 3 |
| 15 | 0 | 1 | 3 | N | N | N | N | N | N | 0 | 2 | 3 |
| 16 | 0 | 3 | 3 | 0 | 4 | 3 | 0 | 3 | 3 | 0 | 3 | 3 |
| 17 | 0 | 3 | 3 | 0 | 4 | 3 | 0 | 2 | 3 | 0 | 3 | 3 |
| 18 | 0 | 3 | 4 | 0 | 4 | 4 | N | N | N | N | N | N |
| 19 | 0 | 1 | 4 | N | N | N | N | N | N | N | N | N |
| 20 | N | N | N | N | N | N | N | N | N | 0 | 2 | 3 |
| 21 | 0 | 2 | 3 | N | N | N | N | N | N | 0 | 3 | 3 |
| 22 | 0 | 2 | 3 | N | N | N | N | N | N | 0 | 3 | 3 |
| 23 | 0 | 2 | 3 | 0 | 1 | 3 | N | N | N | N | N | N |
| 24 | N | N | N | N | N | N | N | N | N | 0 | 1 | 3 |
| 25 | 0 | 1 | 3 | N | N | N | N | N | N | 0 | 2 | 4 |
| 26 | 0 | 2 | 4 | 0 | 3 | 3 | 0 | 3 | 3 | 0 | 4 | 4 |
| 27 | 0 | 2 | 4 | 0 | 3 | 3 | 0 | 5 | 4 | N | N | N |
| 28 | N | N | N | N | N | N | N | N | N | 0 | 1 | 4 |
| 29 | 0 | 2 | 4 | 0 | 3 | 4 | N | N | N | 0 | 5 | 4 |
| 30 | 0 | 5 | 4 | 0 | 4 | 4 | 1 | 5 | 4 | 0 | 3 | 4 |
| 31 | 0 | 3 | 4 | 0 | 3 | 4 | 0 | 2 | 4 | 0 | 2 | 4 |

************************ SECOND INVERSION ************************************

| DAY | 0000-0600 MST | | | 0601-1200 MST | | | 1201-1800 MST | | | 1801-2400 MST | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * | BASE (100M) | TOP (100M) | TYPE * |
| 1 | 3 | 7 | 2 | N | N | N | N | N | N | N | N | N |
| 2 | N | N | N | 2 | 6 | 9 | N | N | N | N | N | N |
| 3 | N | N | N | N | N | N | N | N | N | N | N | N |
| 4 | N | N | N | N | N | N | N | N | N | N | N | N |
| 5 | N | N | N | N | N | N | N | N | N | N | N | N |
| 6 | N | N | N | N | N | N | N | N | N | N | N | N |
| 7 | N | N | N | N | N | N | N | N | N | N | N | N |
| 8 | N | N | N | N | N | N | N | N | N | N | N | N |
| 9 | N | N | N | N | N | N | N | N | N | N | N | N |
| 10 | N | N | N | N | N | N | N | N | N | N | N | N |
| 11 | N | N | N | N | N | N | N | N | N | N | N | N |
| 12 | N | N | N | N | N | N | N | N | N | N | N | N |
| 13 | N | N | N | N | N | N | N | N | N | N | N | N |
| 14 | N | N | N | N | N | N | N | N | N | N | N | N |
| 15 | N | N | N | N | N | N | N | N | N | N | N | N |
| 16 | N | N | N | N | N | N | N | N | N | N | N | N |
| 17 | N | N | N | N | N | N | N | N | N | N | N | N |
| 18 | N | N | N | N | N | N | N | N | N | 2 | 5 | 9 |
| 19 | N | N | N | 2 | 5 | 9 | 2 | 4 | 9 | N | N | N |
| 20 | N | N | N | N | N | N | N | N | N | N | N | N |
| 21 | N | N | N | N | N | N | N | N | N | N | N | N |
| 22 | N | N | N | N | N | N | N | N | N | N | N | N |
| 23 | N | N | N | N | N | N | N | N | N | N | N | N |
| 24 | N | N | N | N | N | N | N | N | N | N | N | N |
| 25 | N | N | N | N | N | N | N | N | N | N | N | N |
| 26 | N | N | N | N | N | N | N | N | N | N | N | N |
| 27 | N | N | N | N | N | N | N | N | N | 1 | 3 | 4 |
| 28 | N | N | N | N | N | N | N | N | N | N | N | N |
| 29 | N | N | N | N | N | N | 2 | 8 | 9 | N | N | N |
| 30 | N | N | N | N | N | N | N | N | N | N | N | N |
| 31 | N | N | N | 4 | 7 | 9 | 4 | 7 | 9 | 3 | 7 | 9 |

NOTE: FOR TYPE 1=FRONTAL, 2=SUBSIDENCE, 3=RADIATION (SPIKED ECHO)
4=RADIATION (LAMINAR ECHO) 9=UNKNOWN
N=NO INVERSION M=MISSING DATA OR UNKNOWN

```
                                  ACOUSTIC RADAR ANALYSIS

ER LODGE VALLEY DISPERSION STUDY            MONTH OF DECEMBER 1978

      ******* FIRST INVERSION FREQUENCY OF OCCURENCE TABLE *******

ICKNESS          INVERSION BASE HEIGHT (IN METERS)
METERS)  SFC   100   200   300   400   500   600   700   800   900   TOTAL

-TIME     0- 600 MST ------------------------------------------------------------

01-100     5     0     0     0     0     0     0     0     0     0       5
01-300    19     0     0     0     0     0     0     0     0     0      19
01-500     3     0     0     0     0     0     0     0     0     0       3
01-900     0     0     0     0     0     0     0     0     0     0       0
 INVERSION                                                               4

TOTAL     27     0     0     0     0     0     0     0     0     0      31

-TIME  601-1200 MST ------------------------------------------------------------

01-100     2     0     0     0     0     0     0     0     0     0       2
01-300    12     0     1     0     0     0     0     0     0     0      13
01-500     5     0     0     0     0     0     0     0     0     0       5
01-900     0     0     0     0     0     0     0     0     0     0       0
 INVERSION                                                              11

TOTAL     19     0     1     0     0     0     0     0     0     0      31

-TIME 1201-1800 MST ------------------------------------------------------------

01-100     1     1     0     0     0     0     0     0     0     0       2
01-300     6     1     1     0     0     0     0     0     0     0       8
01-500     2     2     0     0     0     0     0     0     0     0       4
01-900     0     0     0     0     0     0     0     0     0     0       0
 INVERSION                                                              17

TOTAL      9     4     1     0     0     0     0     0     0     0      31

-TIME 1801-2400 MST ------------------------------------------------------------

01-100     4     0     0     0     0     0     0     0     0     0       4
01-300    18     0     0     0     0     0     0     0     0     0      18
01-500     3     0     0     0     0     0     0     0     0     0       3
01-900     0     0     0     0     0     0     0     0     0     0       0
 INVERSION                                                               6

TOTAL     25     0     0     0     0     0     0     0     0     0      31


--------------- FREQUENCY SUMMARY FOR FIRST INVERSION ----------------------

01-100    12     1     0     0     0     0     0     0     0     0      13
01-300    55     1     2     0     0     0     0     0     0     0      58
01-500    13     2     0     0     0     0     0     0     0     0      15
01-900     0     0     0     0     0     0     0     0     0     0       0
 INVERSION                                                              38

TOTAL     80     4     2     0     0     0     0     0     0     0     124
```

```
                              ACOUSTIC RADAR ANALYSIS

DEER LODGE VALLEY DISPERSION STUDY           MONTH OF DECEMBER 1978

       ******* SECOND INVERSION FREQUENCY OF OCCURENCE TABLE ******

THICKNESS          INVERSION BASE HEIGHT (IN METERS)
 (METERS)   SFC    100    200    300    400    500    600    700    800    900    TOTAL
---TIME    0- 600 MST ---------------------------------------------------------------

 001-100     0      0      0      0      0      0      0      0      0      0        0
 101-300     0      0      0      0      0      0      0      0      0      0        0
 301-500     0      0      0      1      0      0      0      0      0      0        1
 501-900     0      0      0      0      0      0      0      0      0      0        0
NO INVERSION                                                                        30

  TOTAL      0      0      0      1      0      0      0      0      0      0       31
---TIME  601-1200 MST ---------------------------------------------------------------

 001-100     0      0      0      0      0      0      0      0      0      0        0
 101-300     0      0      1      0      1      0      0      0      0      0        2
 301-500     0      0      1      0      0      0      0      0      0      0        1
 501-900     0      0      0      0      0      0      0      0      0      0        0
NO INVERSION                                                                        28

  TOTAL      0      0      2      0      1      0      0      0      0      0       31
---TIME 1201-1800 MST ---------------------------------------------------------------

 001-100     0      0      0      0      0      0      0      0      0      0        0
 101-300     0      0      1      0      1      0      0      0      0      0        2
 301-500     0      0      0      0      0      0      0      0      0      0        0
 501-900     0      0      1      0      0      0      0      0      0      0        1
NO INVERSION                                                                        28

  TOTAL      0      0      2      0      1      0      0      0      0      0       31
---TIME 1801-2400 MST ---------------------------------------------------------------

 001-100     0      0      0      0      0      0      0      0      0      0        0
 101-300     0      1      1      0      0      0      0      0      0      0        2
 301-500     0      0      0      1      0      0      0      0      0      0        1
 501-900     0      0      0      0      0      0      0      0      0      0        0
NO INVERSION                                                                        28

  TOTAL      0      1      1      1      0      0      0      0      0      0       31

---------------- FREQUENCY SUMMARY FOR SECOND INVERSION -----------------------------

 001-100     0      0      0      0      0      0      0      0      0      0        0
 101-300     0      1      3      0      2      0      0      0      0      0        6
 301-500     0      0      1      2      0      0      0      0      0      0        3
 501-900     0      0      1      0      0      0      0      0      0      0        1
NO INVERSION                                                                       114

  TOTAL      0      1      5      2      2      0      0      0      0      0      124
```

```
                    ACOUSTIC RADAR ANALYSIS
R LODGE VALLEY DISPERSION STUDY          MONTH OF DECEMBER 1978

****** TWO HOUR STABILITY ANALYSIS **************************

   ---------------------- HOUR ------------------------------
   02    04    06    08    10    12    14    16    18    20    22    24
    M     M     M     D     D     B     C     M     D     D     D     D
    D     D     M     M     M     M     D     C     D     M     M     M
    M     M     D     D     D     D     D     D     D     D     D     D
    D     D     D     D     D     D     D     D     E     D     E     E
    E     E     E     M     M     M     E     E     E     M     M     M
    M     M     M     M     M     M     D     D     E     M     M     M
    E     M     M     M     M     M     D     D     M     M     M     M
    M     M     M     M     M     M     M     D     M     E     E     E
    M     M     M     M     D     D     C     C     M     M     E     E
    M     E     E     M     M     M     D     D     M     M     M     M
    M     M     D     D     D     D     D     D     M     M     E     E
    M     M     M     M     D     D     D     D     E     M     M     M
    M     M     M     M     E     E     D     D     E     M     M     M
    D     E     E     E     D     D     D     D     E     E     E     E
    E     E     D     D     D     D     D     D     D     C     M     M
    E     E     E     M     M     M     M     E     E     M     M     M
    M     M     M     M     M     M     M     E     E     M     E     E
    E     M     M     M     M     M     D     D     D     D     C     M
    M     M     D     D     D     D     D     D     D     D     D     D
    D     D     D     D     D     D     D     D     M     M     M     M
    M     E     D     D     D     D     C     C     D     E     E     E
    E     E     D     D     D     D     D     D     E     E     E     E
    E     M     M     M     M     D     C     D     D     D     C     D
    D     D     D     D     D     D     D     D     E     E     E     E
    E     M     M     D     C     C     C     D     E     E     M     M
    M     M     M     M     M     M     M     M     M     M     M     M
    M     M     M     E     M     M     M     M     D     D     D     D
    D     D     D     D     D     D     D     D     E     M     M     M
    E     M     M     M     M     M     M     D     E     D     M     M
    M     M     M     M     M     M     D     D     E     M     M     M
    M     M     M     M     M     M     C     M     M     M     M     M
        PERCENT FREQUENCY OF OCCURENCE FOR EACH CATEGORY
 A= 0.0 %  B= 0.5 %  C= 2.7 %  D=35.2 %  E=17.2 %  F= 0.0 %
 U= 0.0 %  M=44.4 %

E: U=UNKNOWN M=MISSING DATA
     CLOUD COVER CONDITIONS USED FROM NWS STATION  AT BUTTE
     WIND DATA TAKEN AT SITE
```

# ACOUSTIC RADAR ANALYSIS

DEER LODGE VALLEY DISPERSION STUDY MONTH OF JANUARY 1979

## ************************ FIRST INVERSION ************************

| DAY | 0000-0600 MST BASE (100M) | TOP (100M) | TYPE * | 0601-1200 MST BASE (100M) | TOP (100M) | TYPE * | 1201-1800 MST BASE (100M) | TOP (100M) | TYPE * | 1801-2400 MST BASE (100M) | TOP (100M) | TYPE * |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 1 | 4 | 0 | 2 | 4 | 0 | 5 | 4 | 0 | 5 | 4 |
| 2 | 0 | 4 | 4 | 0 | 4 | 4 | N | N | N | 0 | 2 | 4 |
| 3 | 0 | 2 | 4 | 0 | 2 | 4 | 0 | 2 | 4 | 0 | 2 | 4 |
| 4 | 2 | 3 | 4 | 0 | 3 | 4 | N | N | N | 0 | 2 | 4 |
| 5 | 0 | 6 | 4 | 0 | 3 | 4 | 0 | 6 | 4 | 0 | 5 | 4 |
| 6 | 0 | 5 | 4 | 0 | 4 | 4 | 0 | 2 | 4 | 0 | 3 | 4 |
| 7 | 0 | 5 | 4 | 0 | 5 | 4 | 0 | 5 | 4 | 0 | 5 | 4 |
| 8 | 0 | 5 | 4 | 0 | 5 | 4 | 0 | 5 | 4 | 0 | 3 | 4 |
| 9 | 0 | 4 | 4 | 0 | 5 | 4 | 0 | 2 | 4 | 0 | 1 | 4 |
| 10 | 0 | 2 | 4 | N | N | N | 0 | 6 | 3 | 0 | 4 | 3 |
| 11 | 0 | 4 | 4 | 0 | 3 | 4 | 0 | 3 | 4 | 0 | 3 | 4 |
| 12 | 1 | 2 | 4 | N | N | N | N | N | N | 0 | 4 | 4 |
| 13 | 0 | 5 | 4 | 0 | 3 | 3 | N | N | N | 0 | 3 | 4 |
| 14 | 0 | 3 | 4 | 0 | 2 | 4 | 0 | 2 | 4 | 0 | 4 | 4 |
| 15 | 0 | 5 | 4 | 0 | 4 | 4 | N | N | N | 0 | 4 | 3 |
| 16 | 0 | 1 | 3 | 0 | 2 | 4 | 0 | 3 | 4 | 0 | 3 | 4 |
| 17 | 0 | 3 | 4 | 0 | 3 | 4 | 0 | 3 | 4 | 0 | 2 | 4 |
| 18 | 0 | 3 | 4 | 1 | 2 | 4 | N | N | N | 0 | 2 | 4 |
| 19 | 0 | 1 | 4 | 0 | 1 | 4 | N | N | N | 0 | 1 | 4 |
| 20 | 0 | 3 | 4 | 0 | 1 | 4 | 1 | 4 | 3 | 0 | 3 | 3 |
| 21 | 0 | 3 | 3 | 0 | 3 | 3 | N | N | N | N | N | N |
| 22 | 0 | 1 | 4 | 0 | 3 | 4 | 1 | 3 | 4 | N | N | N |
| 23 | N | N | N | 0 | 3 | 4 | 0 | 4 | 4 | 0 | 4 | 4 |
| 24 | 0 | 5 | 3 | 0 | 3 | 3 | N | N | N | 0 | 2 | 4 |
| 25 | 0 | 2 | 4 | 0 | 1 | 4 | N | N | N | 0 | 3 | 4 |
| 26 | 0 | 2 | 4 | 0 | 2 | 4 | 1 | 2 | 4 | 0 | 1 | 4 |
| 27 | 0 | 4 | 4 | 0 | 4 | 4 | 3 | 5 | 4 | 0 | 1 | 4 |
| 28 | 0 | 1 | 4 | N | N | N | N | N | N | N | N | N |
| 29 | 0 | 1 | 4 | 0 | 1 | 4 | 1 | 2 | 4 | 0 | 2 | 4 |
| 30 | 0 | 3 | 4 | 0 | 6 | 4 | 0 | 5 | 4 | 0 | 4 | 3 |
| 31 | 3 | 3 | 0 | 3 | 3 | 0 | 0 | 3 | 4 | 0 | 2 | 4 |

## ************************ SECOND INVERSION ************************

| DAY | 0000-0600 MST BASE (100M) | TOP (100M) | TYPE * | 0601-1200 MST BASE (100M) | TOP (100M) | TYPE * | 1201-1800 MST BASE (100M) | TOP (100M) | TYPE * | 1801-2400 MST BASE (100M) | TOP (100M) | TYPE * |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4 | 8 | 9 | 3 | 8 | 9 | N | N | N | N | N | N |
| 2 | N | N | N | N | N | N | 4 | 5 | 9 | 4 | 5 | 9 |
| 3 | 4 | 5 | 9 | N | N | N | N | N | N | N | N | N |
| 4 | N | N | N | N | N | N | N | N | N | N | N | N |
| 5 | N | N | N | N | N | N | N | N | N | N | N | N |
| 6 | N | N | N | N | N | N | N | N | N | N | N | N |
| 7 | N | N | N | N | N | N | N | N | N | N | N | N |
| 8 | N | N | N | N | N | N | N | N | N | N | N | N |
| 9 | N | N | N | N | N | N | N | N | N | 6 | 9 | 9 |
| 10 | 4 | 9 | 9 | 2 | 5 | 9 | N | N | N | N | N | N |
| 11 | N | N | N | N | N | N | N | N | N | N | N | N |
| 12 | 4 | 5 | 9 | 3 | 6 | 9 | 1 | 5 | 9 | N | N | N |
| 13 | N | N | N | N | N | N | N | N | N | N | N | N |
| 14 | N | N | N | N | N | N | N | N | N | 5 | 7 | 9 |
| 15 | N | N | N | N | N | N | N | N | N | N | N | N |
| 16 | N | N | N | N | N | N | N | N | N | N | N | N |
| 17 | N | N | N | N | N | N | N | N | N | N | N | N |
| 18 | N | N | N | 3 | 6 | 9 | 2 | 7 | 9 | 3 | 5 | 9 |
| 19 | 2 | 5 | 4 | 2 | 4 | 4 | 2 | 5 | 4 | 2 | 5 | 4 |
| 20 | N | N | N | N | N | N | N | N | N | N | N | N |
| 21 | N | N | N | N | N | N | N | N | N | N | N | N |
| 22 | N | N | N | N | N | N | N | N | N | N | N | N |
| 23 | N | N | N | N | N | N | N | N | N | N | N | N |
| 24 | N | N | N | N | N | N | N | N | N | N | N | N |
| 25 | N | N | N | N | N | N | 1 | 4 | 9 | N | N | N |
| 26 | N | N | N | N | N | N | 3 | 5 | 9 | 2 | 4 | 9 |
| 27 | N | N | N | N | N | N | N | N | N | N | N | N |
| 28 | N | N | N | N | N | N | N | N | N | 1 | 2 | 9 |
| 29 | N | N | N | N | N | N | N | N | N | N | N | N |
| 30 | N | N | N | N | N | N | N | N | N | N | N | N |
| 31 | N | N | N | 4 | 6 | 9 | N | N | N | N | N | N |

NOTE: FOR TYPE 1=FRONTAL,2=SUBSIDENCE,3=RADIATION (SPIKED ECHO)
4=RADIATION (LAMINAR ECHO) 9=UNKNOWN
N=NO INVERSION M=MISSING DATA OR UNKNOWN

```
                                    ACOUSTIC RADAR ANALYSIS

ER LODGE VALLEY DISPERSION STUDY                                    MONTH OF JANUARY  1979

         ******* FIRST INVERSION FREQUENCY OF OCCURRENCE TABLE *******

ICKNESS                   INVERSION BASE HEIGHT (IN METERS)
METERS)        SFC       100       200       300       400       500       600       700       800       900       TOTAL

-TIME          0- 600 MST -------------------------------------------------------------------------------------------------

01-100               6         1         1         1         0         0         0         0         0         0          9
01-300              11         0         0         0         0         0         0         0         0         0         11
01-500               8         0         0         0         0         0         0         0         0         0          8
01-900               2         0         0         0         0         0         0         0         0         0          2
  INVERSION                                                                                                               1

TOTAL               27         1         1         1         0         0         0         0         0         0         31

-TIME       601-1200 MST ---------------------------------------------------------------------------------------------------

01-100               4         1         0         1         0         0         0         0         0         0          6
01-300              13         0         0         0         0         0         0         0         0         0         13
01-500               7         0         0         0         0         0         0         0         0         0          7
01-900               2         0         0         0         0         0         0         0         0         0          2
  INVERSION                                                                                                               3

TOTAL               26         1         0         1         0         0         0         0         0         0         31

-TIME     1201-1800 MST ---------------------------------------------------------------------------------------------------

01-100               0         2         0         0         0         0         0         0         0         0          2
01-300               8         2         0         1         0         0         0         0         0         0         11
01-500               5         0         0         0         0         0         0         0         0         0          5
01-900               2         0         0         0         0         0         0         0         0         0          2
  INVERSION                                                                                                              11

TOTAL               15         4         0         1         0         0         0         0         0         0         31

-TIME     1801-2400 MST ---------------------------------------------------------------------------------------------------

01-100               4         0         0         0         0         0         0         0         0         0          4
01-300              15         0         0         0         0         0         0         0         0         0         15
01-500               9         0         0         0         0         0         0         0         0         0          9
01-900               0         0         0         0         0         0         0         0         0         0          0
  INVERSION                                                                                                               3

TOTAL               28         0         0         0         0         0         0         0         0         0         31


------------------------ FREQUENCY SUMMARY FOR FIRST INVERSION ----------------------------------------------------------

01-100              14         4         1         2         0         0         0         0         0         0         21
01-300              47         2         0         1         0         0         0         0         0         0         50
01-500              29         0         0         0         0         0         0         0         0         0         29
01-900               6         0         0         0         0         0         0         0         0         0          6
  INVERSION                                                                                                              18

TOTAL               96         6         1         3         0         0         0         0         0         0        124
```

```
                          ACOUSTIC RADAR ANALYSIS
DEER LODGE VALLEY DISPERSION STUDY            MONTH OF JANUARY  1979

       ****** SECOND INVERSION FREQUENCY OF OCCURENCE TABLE ******

THICKNESS           INVERSION BASE HEIGHT (IN METERS)
 (METERS)   SFC    100    200    300    400    500    600    700    800    900    TOTAL

---TIME     0- 600 MST ------------------------------------------------------------------

 001-100     0      0      0      0      2      0      0      0      0      0        2
 101-300     0      0      1      0      0      0      0      0      0      0        1
 301-500     0      0      0      0      2      0      0      0      0      0        2
 501-900     0      0      0      0      0      0      0      0      0      0        0
NO INVERSION                                                                        26

  TOTAL      0      0      1      0      4      0      0      0      0      0       31
---TIME  601-1200 MST ------------------------------------------------------------------

 001-100     0      0      0      0      0      0      0      0      0      0        0
 101-300     0      0      2      2      1      0      0      0      0      0        5
 301-500     0      0      0      1      0      0      0      0      0      0        1
 501-900     0      0      0      0      0      0      0      0      0      0        0
NO INVERSION                                                                        25

  TOTAL      0      0      2      3      1      0      0      0      0      0       31
---TIME 1201-1800 MST ------------------------------------------------------------------

 001-100     0      0      0      0      1      0      0      0      0      0        1
 101-300     0      1      1      1      0      0      0      0      0      0        3
 301-500     0      1      1      0      0      0      0      0      0      0        2
 501-900     0      0      0      0      0      0      0      0      0      0        0
NO INVERSION                                                                        25

  TOTAL      0      2      2      1      1      0      0      0      0      0       31
---TIME 1801-2400 MST ------------------------------------------------------------------

 001-100     0      1      0      0      1      0      0      0      0      0        2
 101-300     0      0      2      1      0      1      1      0      0      0        5
 301-500     0      0      0      0      0      0      0      0      0      0        0
 501-900     0      0      0      0      0      0      0      0      0      0        0
NO INVERSION                                                                        24

  TOTAL      0      1      2      1      1      1      1      0      0      0       31

----------------- FREQUENCY SUMMARY FOR SECOND INVERSION ---------------------------------

 001-100     0      1      0      0      4      0      0      0      0      0        5
 101-300     0      1      6      4      1      1      1      0      0      0       14
 301-500     0      1      1      1      2      0      0      0      0      0        5
 501-900     0      0      0      0      0      0      0      0      0      0        0
NO INVERSION                                                                       100

  TOTAL      0      3      7      5      7      1      1      0      0      0      124
```

```
                       ACOUSTIC RADAR ANALYSIS
EER LODGE VALLEY DISPERSION STUDY          MONTH OF JANUARY  1979

******** TWO HOUR STABILITY ANALYSIS **************************

      --------------------- HOUR ------------------------------
AY    02   04   06   08   10   12   14   16   18   20   22   24
1      M    M    M    M    M    M    M    E    E    M    M    M
2      M    M    M    M    M    M    D    E    E    M    M    M
3      M    M    M    M    M    M    M    E    D    M    M    D
4      D    D    D    M    M    D    B    B    M    M    M    M
5      M    M    M    M    M    M    M    M    M    M    M    M
6      M    M    M    M    M    M    M    M    M    M    M    M
7      M    M    M    M    M    M    M    M    M    E    M    M
8      M    M    M    M    M    M    M    M    M    M    M    M
9      M    M    M    M    M    B    E    M    M    M    M    M
0      M    M    M    D    D    D    E    E    E    E    E    E
1      M    M    M    M    M    M    M    M    M    M    M    M
2      D    D    D    D    D    D    B    E    M    M    M    M
3      M    M    M    E    E    D    E    D    M    M    M    M
4      M    M    M    M    M    M    M    M    M    M    M    M
5      M    M    M    M    M    E    D    E    E    E    E    M
6      E    E    E    E    M    M    M    M    M    M    M    M
7      M    M    M    M    M    D    D    M    M    M    M    M
8      M    M    M    M    D    B    D    B    M    M    M    M
9      M    M    M    M    M    D    D    E    D    E    M    M
0      M    M    M    M    D    D    E    E    E    E    E    E
1      E    E    E    E    D    D    D    E    D    D    E    D
2      M    M    M    M    M    M    E    E    D    E    E    D
3      D    D    D    D    M    E    M    M    M    M    M    M
4      M    M    M    E    E    E    D    D    M    M    M    M
5      E    E    E    M    M    D    E    E    D    M    M    M
6      E    E    E    E    M    M    M    E    E    M    M    M
7      M    M    M    M    M    D    C    C    D    E    M    M
8      M    M    M    M    D    D    B    E    E    E    D    M
9      M    M    E    E    M    B    B    B    D    M    M    M
0      M    M    M    M    M    M    M    M    M    M    M    M
       M    M    M    M    M    D    D    M    M    M    M    U
          PERCENT FREQUENCY OF OCCURENCE FOR EACH CATEGORY
  A=  0.0 %   B=  3.8 %   C=  0.5 %   D=19.5 %   E=10.5 %   F=  0.0 %
  U=  0.3 %   M=65.1 %
TE: U=UNKNOWN M=MISSING DATA
     CLOUD COVER CONDITIONS USED FROM NWS STATION  AT BUTTE
     WIND DATA TAKEN AT SITE
```

```
                              ACOUSTIC RADAR ANALYSIS

DEER LODGE VALLEY DISPERSION STUDY            MONTH OF FEBRUARY 1979

************************* FIRST INVERSION ***********************************
       0000-0600 MST       0601-1200 MST        1201-1800 MST       1801-2400 MST
DAY     BASE TOP  TYPE     BASE  TOP  TYPE      BASE  TOP  TYPE     BASE  TOP  TYPE
       (100M)(100M) *      (100M)(100M) *       (100M)(100M) *      (100M)(100M) *

  1      0     2    4       0     1     4        1     2     4       0     1     4
  2      0     1    4       0     2     4        N     N     N       0     2     4
  3      0     2    4       0     2     4        N     N     N       0     3     4
  4      0     4    4       0     3     4        0     2     4       N     N     N
  5      1     2    3       0     2     3        N     N     N       0     1     3
  6      N     N    N       N     N     N        N     N     N       N     N     N
  7      N     N    N       N     N     N        N     N     N       0     1     4
  8      0     2    4       0     3     4        0     2     3       0     2     3
  9      0     3    3       0     3     3        1     3     3       0     2     3
 10      0     2    3       0     2     3        N     N     N       0     3     3
 11      0     3    3       0     2     3        N     N     N       0     2     3
 12      1     3    3       N     N     N        N     N     N       0     2     3
 13      N     N    N       0     2     3        N     N     N       0     1     3
 14      N     N    N       N     N     N        1     2     9       N     N     N
 15      N     N    N       1     2     4        1     3     4       0     3     4
 16      0     2    4       0     3     3        0     3     3       0     3     3
 17      0     3    3       0     2     3        N     N     N       0     2     3
 18      0     2    3       0     3     3        N     N     N       0     3     3
 19      0     3    3       0     2     4        N     N     N       0     2     4
 20      0     2    4       0     2     4        N     N     N       0     3     4
 21      0     3    3       0     3     4        N     N     N       N     N     N
 22      0     3    4       N     N     N        N     N     N       N     N     N
 23      0     1    4       0     1     4        N     N     N       0     1     4
 24      0     4    4       0     3     3        N     N     N       0     2     3
 25      0     3    3       0     3     3        N     N     N       0     3     3
 26      0     3    3       0     3     3        N     N     N       0     3     4
 27      0     4    4       0     2     4        N     N     N       0     3     3
 28      0     2    3       N     N     N        N     N     N       N     N     N

************************* SECOND INVERSION **********************************
       0000-0600 MST       0601-1200 MST        1201-1800 MST       1801-2400 MST
DAY     BASE TOP  TYPE     BASE  TOP  TYPE      BASE  TOP  TYPE     BASE  TOP  TYPE
       (100M)(100M) *      (100M)(100M) *       (100M)(100M) *      (100M)(100M) *

  1      N     N    N       N     N     N        N     N     N       N     N     N
  2      N     N    N       N     N     N        2     4     9       N     N     N
  3      N     N    N       N     N     N        N     N     N       N     N     N
  4      N     N    N       N     N     N        N     N     N       N     N     N
  5      N     N    N       N     N     N        N     N     N       N     N     N
  6      N     N    N       N     N     N        N     N     N       N     N     N
  7      N     N    N       N     N     N        N     N     N       N     N     N
  8      N     N    N       N     N     N        N     N     N       N     N     N
  9      N     N    N       N     N     N        N     N     N       N     N     N
 10      N     N    N       N     N     N        N     N     N       N     N     N
 11      N     N    N       N     N     N        N     N     N       N     N     N
 12      N     N    N       N     N     N        N     N     N       N     N     N
 13      N     N    N       N     N     N        N     N     N       N     N     N
 14      N     N    N       N     N     N        4     5     9       N     N     N
 15      N     N    N       N     N     N        N     N     N       N     N     N
 16      N     N    N       N     N     N        N     N     N       N     N     N
 17      N     N    N       N     N     N        N     N     N       N     N     N
 18      N     N    N       N     N     N        N     N     N       N     N     N
 19      N     N    N       N     N     N        4     6     9       3     5     9
 20      N     N    N       N     N     N        N     N     N       N     N     N
 21      N     N    N       N     N     N        N     N     N       N     N     N
 22      N     N    N       N     N     N        N     N     N       N     N     N
 23      N     N    N       2     4     9        1     3     9       3     5     9
 24      N     N    N       N     N     N        N     N     N       N     N     N
 25      N     N    N       N     N     N        N     N     N       N     N     N
 26      N     N    N       N     N     N        N     N     N       N     N     N
 27      N     N    N       N     N     N        N     N     N       N     N     N
 28      N     N    N       3     5     9        3     5     9       N     N     N

      NOTE:  FOR TYPE 1=FRONTAL,2=SUBSIDENCE,3=RADIATION (SPIKED ECHO)
                      4=RADIATION (LAMINAR ECHO) 9=UNKNOWN
             N=NO INVERSION M=MISSING DATA OR UNKNOWN
```

```
                         ACOUSTIC RADAR ANALYSIS

ER LODGE VALLEY DISPERSION STUDY              MONTH OF FEBRUARY 1979

      ******* FIRST INVERSION FREQUENCY OF OCCURENCE TABLE *******

ICKNESS              INVERSION BASE HEIGHT (IN METERS)
METERS)   SFC    100    200    300    400    500    600    700    800    900    TOTAL

-TIME      0- 600 MST ------------------------------------------------------------------

01-100      2      1      0      0      0      0      0      0      0      0       3
01-300     16      1      0      0      0      0      0      0      0      0      17
01-500      3      0      0      0      0      0      0      0      0      0       3
01-900      0      0      0      0      0      0      0      0      0      0       0
 INVERSION                                                                        5

TOTAL      21      2      0      0      0      0      0      0      0      0      28

-TIME   601-1200 MST ------------------------------------------------------------------

01-100      2      1      0      0      0      0      0      0      0      0       3
01-300     19      0      0      0      0      0      0      0      0      0      19
01-500      0      0      0      0      0      0      0      0      0      0       0
01-900      0      0      0      0      0      0      0      0      0      0       0
 INVERSION                                                                        6

TOTAL      21      1      0      0      0      0      0      0      0      0      28

-TIME 1201-1800 MST ------------------------------------------------------------------

01-100      0      2      0      0      0      0      0      0      0      0       2
01-300      3      2      0      0      0      0      0      0      0      0       5
01-500      0      0      0      0      0      0      0      0      0      0       0
01-900      0      0      0      0      0      0      0      0      0      0       0
 INVERSION                                                                       21

TOTAL       3      4      0      0      0      0      0      0      0      0      28

-TIME 1801-2400 MST ------------------------------------------------------------------

01-100      5      0      0      0      0      0      0      0      0      0       5
01-300     17      0      0      0      0      0      0      0      0      0      17
01-500      0      0      0      0      0      0      0      0      0      0       0
01-900      0      0      0      0      0      0      0      0      0      0       0
 INVERSION                                                                        6

TOTAL      22      0      0      0      0      0      0      0      0      0      28


--------------- FREQUENCY SUMMARY FOR FIRST INVERSION ---------------------------

01-100      9      4      0      0      0      0      0      0      0      0      13
01-300     55      3      0      0      0      0      0      0      0      0      58
01-500      3      0      0      0      0      0      0      0      0      0       3
01-900      0      0      0      0      0      0      0      0      0      0       0
 INVERSION                                                                       38

TOTAL      67      7      0      0      0      0      0      0      0      0     112
```

```
                              ACOUSTIC RADAR ANALYSIS

DEER LODGE VALLEY DISPERSION STUDY            MONTH OF FEBRUARY 1979

        ******* SECOND INVERSION FREQUENCY OF OCCURENCE TABLE ******

THICKNESS           INVERSION BASE HEIGHT (IN METERS)
 (METERS)   SFC    100    200    300    400    500    600    700    800    900    TOTAL
---TIME    0- 600 MST ---------------------------------------------------------------

  001-100     0      0      0      0      0      0      0      0      0      0      0
  101-300     0      0      0      0      0      0      0      0      0      0      0
  301-500     0      0      0      0      0      0      0      0      0      0      0
  501-900     0      0      0      0      0      0      0      0      0      0      0
NO INVERSION                                                                       28

   TOTAL      0      0      0      0      0      0      0      0      0      0     28
---TIME  601-1200 MST ---------------------------------------------------------------

  001-100     0      0      0      0      0      0      0      0      0      0      0
  101-300     0      0      1      1      0      0      0      0      0      0      2
  301-500     0      0      0      0      0      0      0      0      0      0      0
  501-900     0      0      0      0      0      0      0      0      0      0      0
NO INVERSION                                                                       26

   TOTAL      0      0      1      1      0      0      0      0      0      0     28
---TIME 1201-1800 MST ---------------------------------------------------------------

  001-100     0      0      0      0      1      0      0      0      0      0      1
  101-300     0      1      1      1      1      0      0      0      0      0      4
  301-500     0      0      0      0      0      0      0      0      0      0      0
  501-900     0      0      0      0      0      0      0      0      0      0      0
NO INVERSION                                                                       23

   TOTAL      0      1      1      1      2      0      0      0      0      0     28
---TIME 1801-2400 MST ---------------------------------------------------------------

  001-100     0      0      0      0      0      0      0      0      0      0      0
  101-300     0      0      0      2      0      0      0      0      0      0      2
  301-500     0      0      0      0      0      0      0      0      0      0      0
  501-900     0      0      0      0      0      0      0      0      0      0      0
NO INVERSION                                                                       26

   TOTAL      0      0      0      2      0      0      0      0      0      0     28

----------------- FREQUENCY SUMMARY FOR SECOND INVERSION ----------------------------

  001-100     0      0      0      0      1      0      0      0      0      0      1
  101-300     0      1      2      4      1      0      0      0      0      0      8
  301-500     0      0      0      0      0      0      0      0      0      0      0
  501-900     0      0      0      0      0      0      0      0      0      0      0
NO INVERSION                                                                      103

   TOTAL      0      1      2      4      2      0      0      0      0      0    112
```

```
                        ACOUSTIC RADAR ANALYSIS
EER LODGE VALLEY DISPERSION STUDY          MONTH OF FEBRUARY 1979

******* TWO HOUR STABILITY ANALYSIS **************************

     -------------------- HOUR ------------------------------
AY   02   04   06   08   10   12   14   16   18   20   22   24
1    M    M    M    M    M    M    M    D    D    M    M    M
2    M    M    M    M    M    M    M    D    D    D    M    M
3    E    E    E    E    D    D    D    D    D    D    M    M
4    M    M    M    M    M    M    M    M    D    C    D    E
5    E    D    D    E    E    D    D    D    D    E    E    E
6    E    E    M    M    M    D    C    C    D    D    D    D
7    D    D    E    D    D    D    C    C    C    D    E    M
8    M    M    M    M    E    E    E    E    E    E    E    E
9    E    E    E    E    E    E    D    D    E    E    E    E
0    E    E    E    E    D    D    D    D    D    E    E    E
1    E    E    E    E    M    D    D    D    D    E    E    E
2    D    D    D    E    D    D    D    D    D    E    E    D
3    D    D    E    E    D    D    D    D    D    E    E    D
4    D    D    D    D    D    D    D    D    D    D    C    D
5    D    D    D    D    D    D    D    D    C    M    M    M
6    M    M    M    M    M    M    E    E    M    M    E    E
7    M    E    M    E    M    E    D    D    C    E    E    E
8    E    E    E    E    E    D    D    D    E    E    E    M
9    M    M    M    M    M    M    D    C    C    M    M    M
0    M    M    M    M    M    D    D    D    D    M    M    M
1    E    E    M    M    M    M    M    D    D    D    D    D
2    M    M    D    D    C    C    C    C    C    D    D    D
3    D    M    M    M    M    D    D    D    D    M    M    M
4    M    M    M    E    E    D    D    D    C    E    E    E
5    E    E    E    E    E    D    D    D    C    E    E    E
6    M    E    E    M    M    D    D    D    C    M    M    M
7    D    M    M    M    D    D    C    D    E    E    E    E
8    E    M    E    M    D    C    C    C    C    D    D    M
        PERCENT FREQUENCY OF OCCURENCE FOR EACH CATEGORY
  A= 0.0 %  B= 0.0 %  C= 3.9 %  D=38.4 %  E=28.3 %  F= 0.0 %
  U= 0.0 %  M=29.5 %
TE: U=UNKNOWN M=MISSING DATA
     CLOUD COVER CONDITIONS USED FROM NWS STATION  AT BUTTE
     WIND DATA TAKEN AT SITE
```

```
                              ACOUSTIC RADAR ANALYSIS

DEER LODGE VALLEY DISPERSION STUDY              MONTH OF MARCH    1979

************************ FIRST INVERSION ********************************
        0000-0600 MST      0601-1200 MST      1201-1800 MST      1801-2400 MST
DAY     BASE TOP  TYPE     BASE  TOP  TYPE    BASE  TOP  TYPE    BASE  TOP  TYPE
        (100M)(100M) *     (100M)(100M) *     (100M)(100M) *     (100M)(100M) *

 1       0     1    4       N     N    N       N     N    N       0     2    4
 2       0     3    4       0     4    4       N     N    N       0     2    4
 3       0     3    4       0     3    4       1     4    4       0     3    4
 4       0     3    4       0     3    3       N     N    N       0     2    4
 5       0     3    3       N     N    N       1     4    4       0     3    4
 6       0     2    3       0     1    4       N     N    N       0     3    3
 7       0     3    3       N     N    N       N     N    N       0     1    4
 8       0     1    4       N     N    N       N     N    N       0     1    4
 9       N     N    N       0     1    4       N     N    N       0     1    4
10       0     2    4       0     4    3       1     3    3       0     3    4
11       0     3    4       0     2    4       N     N    N       0     2    4
12       0     3    3       0     3    3       N     N    N       0     1    4
13       0     2    4       N     N    N       N     N    N       0     1    4
14       0     2    4       1     3    4       N     N    N       0     2    4
15       0     3    4       0     3    3       N     N    N       0     2    3
16       0     2    3       N     N    N       N     N    N       2     4    2
17       0     2    3       0     3    3       N     N    N       N     N    N
18       0     1    4       0     1    4       N     N    N       N     N    N
19       1     4    4       N     N    N       N     N    N       N     N    N
20       1     2    4       N     N    N       N     N    N       0     1    4
21       0     1    4       1     4    4       N     N    N       0     1    3
22       0     1    3       N     N    N       N     N    N       0     2    4
23       0     4    4       1     4    4       N     N    N       0     1    4
24       0     2    3       N     N    N       N     N    N       0     1    3
25       0     1    3       0     8    1       N     N    N       N     N    N
26       N     N    N       N     N    N       N     N    N       3     5    1
27       0     3    4       0     2    4       1     2    1       1     2    1
28       0     1    4       0     4    4       0     3    9       0     4    4
29       0     4    3       N     N    N       N     N    N       0     1    3
30       0     1    3       N     N    N       N     N    N       0     1    3
31       0     2    3       N     N    N       N     N    N       0     2    4

************************ SECOND INVERSION *******************************
        0000-0600 MST      0601-1200 MST      1201-1800 MST      1801-2400 MST
DAY     BASE TOP  TYPE     BASE  TOP  TYPE    BASE  TOP  TYPE    BASE  TOP  TYPE
        (100M)(100M) *     (100M)(100M) *     (100M)(100M) *     (100M)(100M) *

 1       N     N    N       N     N    N       N     N    N       N     N    N
 2       N     N    N       N     N    N       N     N    N       N     N    N
 3       N     N    N       N     N    N       N     N    N       N     N    N
 4       N     N    N       N     N    N       N     N    N       N     N    N
 5       N     N    N       N     N    N       N     N    N       N     N    N
 6       N     N    N       N     N    N       N     N    N       N     N    N
 7       N     N    N       N     N    N       N     N    N       N     N    N
 8       N     N    N       N     N    N       N     N    N       N     N    N
 9       N     N    N       N     N    N       N     N    N       N     N    N
10       N     N    N       N     N    N       N     N    N       N     N    N
11       N     N    N       N     N    N       N     N    N       N     N    N
12       N     N    N       N     N    N       N     N    N       N     N    N
13       N     N    N       N     N    N       N     N    N       N     N    N
14       N     N    N       N     N    N       N     N    N       N     N    N
15       N     N    N       N     N    N       N     N    N       N     N    N
16       N     N    N       N     N    N       N     N    N       N     N    N
17       N     N    N       N     N    N       N     N    N       N     N    N
18       4     5    9       3     4    9       N     N    N       N     N    N
19       N     N    N       N     N    N       N     N    N       N     N    N
20       N     N    N       N     N    N       N     N    N       N     N    N
21       N     N    N       N     N    N       N     N    N       2     4    5
22       N     N    N       N     N    N       N     N    N       N     N    N
23       N     N    N       N     N    N       N     N    N       N     N    N
24       N     N    N       N     N    N       N     N    N       N     N    N
25       N     N    N       N     N    N       N     N    N       N     N    N
26       2     6    9       3     6    9       N     N    N       N     N    N
27       N     N    N       N     N    N       4     6    1       7     8    1
28       4     6    1       N     N    N       N     N    N       N     N    N
29       N     N    N       N     N    N       N     N    N       N     N    N
30       N     N    N       N     N    N       N     N    N       N     N    N
31       N     N    N       N     N    N       N     N    N       N     N    N
```

```
                    ACOUSTIC RADAR ANALYSIS
EER LODGE VALLEY DISPERSION STUDY          MONTH OF MARCH    1979
      ******* FIRST INVERSION FREQUENCY OF OCCURENCE TABLE *******
HICKNESS          INVERSION BASE HEIGHT (IN METERS)
(METERS)  SFC    100    200    300    400    500    600    700    800    900    TOTAL
--TIME     0- 600 MST -------------------------------------------------------------------
001-100     8      1      0      0      0      0      0      0      0      0       9
101-300    17      1      0      0      0      0      0      0      0      0      18
301-500     2      0      0      0      0      0      0      0      0      0       2
501-900     0      0      0      0      0      0      0      0      0      0       0
O INVERSION                                                                        2

TOTAL      27      2      0      0      0      0      0      0      0      0      31
--TIME  601-1200 MST ---------------------------------------------------------------------
001-100     3      0      0      0      0      0      0      0      0      0       3
101-300     7      3      0      0      0      0      1      0      0      0      11
301-500     3      0      0      0      0      0      0      0      0      0       3
501-900     0      0      0      0      0      0      0      0      0      0       0
O INVERSION                                                                       14

TOTAL      13      3      0      0      0      0      1      0      0      0      31
--TIME 1201-1800 MST ---------------------------------------------------------------------
001-100     0      1      0      0      0      0      0      0      0      0       1
101-300     1      3      0      0      0      0      0      0      0      0       4
301-500     0      0      0      0      0      0      0      0      0      0       0
501-900     0      0      0      0      0      0      0      0      0      0       0
O INVERSION                                                                       26

TOTAL       1      4      0      0      0      0      0      0      0      0      31
--TIME 1801-2400 MST ---------------------------------------------------------------------
001-100    11      1      0      0      0      0      0      0      0      0      12
101-300    12      0      1      1      0      0      0      0      0      0      14
301-500     1      0      0      0      0      0      0      0      0      0       1
501-900     0      0      0      0      0      0      0      0      0      0       0
O INVERSION                                                                        4

TOTAL      24      1      1      1      0      0      0      0      0      0      31

---------------- FREQUENCY SUMMARY FOR FIRST INVERSION -----------------------------------
001-100    22      3      0      0      0      0      0      0      0      0      25
101-300    37      7      1      1      0      0      1      0      0      0      47
301-500     6      0      0      0      0      0      0      0      0      0       6
501-900     0      0      0      0      0      0      0      0      0      0       0
O INVERSION                                                                       46

TOTAL      65     10      1      1      0      0      1      0      0      0     124
```

```
                         ACOUSTIC RADAR ANALYSIS

DEER LODGE VALLEY DISPERSION STUDY           MONTH OF MARCH     1979

      ****** SECOND INVERSION FREQUENCY OF OCCURENCE TABLE ******

THICKNESS          INVERSION BASE HEIGHT (IN METERS)
 (METERS)   SFC    100    200    300    400    500    600    700    800    900    TOTAL
---TIME    0- 600 MST ---------------------------------------------------------------

 001-100     0      0      0      0      1      0      0      0      0      0      1
 101-300     0      0      0      0      1      0      0      0      0      0      1
 301-500     0      0      1      0      0      0      0      0      0      0      1
 501-900     0      0      0      0      0      0      0      0      0      0      0
NO INVERSION                                                                       28

  TOTAL      0      0      1      0      2      0      0      0      0      0     31
---TIME  601-1200 MST ---------------------------------------------------------------

 001-100     0      0      0      1      0      0      0      0      0      0      1
 101-300     0      0      0      1      0      0      0      0      0      0      1
 301-500     0      0      0      0      0      0      0      0      0      0      0
 501-900     0      0      0      0      0      0      0      0      0      0      0
NO INVERSION                                                                       29

  TOTAL      0      0      0      2      0      0      0      0      0      0     31
---TIME 1201-1800 MST ---------------------------------------------------------------

 001-100     0      0      0      0      0      0      0      0      0      0      0
 101-300     0      0      0      0      1      0      0      0      0      0      1
 301-500     0      0      0      0      0      0      0      0      0      0      0
 501-900     0      0      0      0      0      0      0      0      0      0      0
NO INVERSION                                                                       30

  TOTAL      0      0      0      0      1      0      0      0      0      0     31
---TIME 1801-2400 MST ---------------------------------------------------------------

 001-100     0      0      0      0      0      0      0      1      0      0      1
 101-300     0      0      1      0      0      0      0      0      0      0      1
 301-500     0      0      0      0      0      0      0      0      0      0      0
 501-900     0      0      0      0      0      0      0      0      0      0      0
NO INVERSION                                                                       29

  TOTAL      0      0      1      0      0      0      0      1      0      0     31


------------------ FREQUENCY SUMMARY FOR SECOND INVERSION ----------------------------

 001-100     0      0      0      1      1      0      0      1      0      0      3
 101-300     0      0      1      1      2      0      0      0      0      0      4
 301-500     0      0      1      0      0      0      0      0      0      0      1
 501-900     0      0      0      0      0      0      0      0      0      0      0
NO INVERSION                                                                      116

  TOTAL      0      0      2      2      3      0      0      1      0      0    124
```

```
                      ACOUSTIC RADAR ANALYSIS
EER LODGE VALLEY DISPERSION STUDY          MONTH OF MARCH     1979


******** TWO HOUR STABILITY ANALYSIS **************************

     ---------------------- HOUR ---------------------------------
AY    02    04    06    08    10    12    14    16    18    20    22    24
1     M     D     D     D     D     M     C     C     C     E     E     M
2     M     M     M     M     M     D     C     C     E     M     M     M
3     M     M     M     M     M     M     M     C     C     M     M     M
4     M     D     D     E     E     E     E     D     C     M     M     E
5     E     E     D     D     D     D     M     D     D     E     M     M
6     E     D     E     E     E     D     C     C     C     M     E     E
7     E     D     D     D     D     D     D     D     D     E     E     D
3     E     D     D     D     D     D     C     C     C     M     M     M
9     D     D     M     E     D     M     B     C     C     M     M     M
0     M     M     M     M     M     D     D     D     E     E     M     M
1     M     M     M     M     D     M     C     C     E     M     M     M
2     E     M     M     E     D     D     C     D     E     E     E     M
3     M     M     D     E     D     C     C     C     C     M     M     E
4     M     M     M     M     D     E     M     C     E     M     E     E
5     M     M     M     M     D     E     C     D     E     M     E     M
6     M     M     M     E     D     M     C     E     E     E     D     C
7     M     M     M     M     M     M     D     E     D     E     E     M
3     M     M     M     M     M     E     M     E     E     E     E     E
9     E     D     M     D     B     C     C     C     E     E     E     M
)     M     D     D     D     B     M     M     C     C     E     M     M
1     M     E     E     E     D     D     M     C     C     M     E     E
2     M     M     M     D     C     C     C     C     C     E     M     M
3     E     M     M     M     E     D     C     C     C     M     E     E
4     M     M     M     E     E     D     C     C     D     E     M     M
5     M     M     D     D     C     C     E     C     D     E     D     E
6     M     D     D     D     C     D     D     E     D     D     E     M
7     M     M     M     M     D     D     C     D     C     E     D     E
8     E     M     M     M     M     D     D     D     D     E     M     M
9     M     M     M     D     C     C     C     D     C     E     M     M
0     M     M     M     D     D     C     C     C     C     E     M     M
1     M     M     M     E     C     C     C     C     C     M     M     M
       PERCENT FREQUENCY OF OCCURENCE FOR EACH CATEGORY
   A= 0.0 %  B= 1.9 %  C=16.9 %  D=31.2 %  E=12.1 %  F= 0.0 %
   U= 0.0 %  M=37.9 %

TE:  U=UNKNOWN M=MISSING DATA
      CLOUD COVER CONDITIONS USED FROM NWS STATION  AT BUTTE
      WIND DATA TAKEN AT SITE
```

```
**************************************************************************************

                 FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

   LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

           SURFACE WINDS MORNING           MAY,1978

  DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
               00.1   03.0   06.0   10.0   16.0   GREATER       ROW    SUMMARY
                TO     TO     TO     TO     TO     THAN       TOTAL    TOTAL   AVERAGE
               02.9   05.9   09.9   15.9   25.0    25.0      COUNT   PERCENT   SPEED

       N                                                        0       0.0
     NNE                                                        0       0.0
      NE        8.3                                             1       8.3        .9
     ENE       25.0                                             3      25.0       1.3
       E        8.3                                             1       8.3        .9
     ESE                                                        0       0.0
      SE                                                        0       0.0
     SSE                                                        0       0.0
       S                                                        0       0.0
     SSW                                                        0       0.0
      SW       25.0                                             3      25.0       1.1
     WSW               8.3                                      1       8.3       3.1
       W        8.3                                             1       8.3       2.7
     WNW        8.3    8.3                                      2      16.6       3.4
      NW                                                        0       0.0
     NNW                                                        0       0.0

    CALM                                                        0       0.0

 COL. TOTALS   83.2   16.6                                     12                 1.8

           SURFACE WINDS AFTERNOON         MAY,1978

  DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
               00.1   03.0   06.0   10.0   16.0   GREATER       ROW    SUMMARY
                TO     TO     TO     TO     TO     THAN       TOTAL    TOTAL   AVERAGE
               02.9   05.9   09.9   15.9   25.0    25.0      COUNT   PERCENT   SPEED

       N                                                        0       0.0
     NNE        9.0                                             1       9.0        .9
      NE              18.1                                      2      18.1       4.2
     ENE        9.0                                             1       9.0       1.8
       E                                                        0       0.0
     ESE        9.0                                             1       9.0       2.2
      SE                                                        0       0.0
     SSE                                                        0       0.0
       S                                                        0       0.0
     SSW                                                        0       0.0
      SW                                                        0       0.0
     WSW                                                        0       0.0
       W               9.0                                      1       9.0       4.5
     WNW        9.0    9.0   27.2                               5      45.2       5.7
      NW                                                        0       0.0
     NNW                                                        0       0.0

    CALM                                                        0       0.0

 COL. TOTALS   36.0   36.1   27.2                              11                 4.2
```

```
            FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

00 METER LEVEL WINDS MORNING              MAY,1978

DIRECTION    ********* WIND SPEEDS METERS/SECOND ******************************
           00.1   03.0   06.0   10.0   16.0  GREATER      ROW   SUMMARY
            TO     TO     TO     TO     TO     THAN     TOTAL   TOTAL  AVERAGE
           02.9   05.9   09.9   15.9   25.0    25.0     COUNT  PERCENT  SPEED

    N                                                     0      0.0
  NNE       8.3    8.3                                    2     16.6      3.4
   NE                                                     0      0.0
  ENE                                                     0      0.0
    E      16.6                                           2     16.6       .8
  ESE                                                     0      0.0
   SE                                                     0      0.0
  SSE              8.3                                    1      8.3      3.8
    S              8.3                                    1      8.3      4.1
  SSW                                                     0      0.0
   SW             16.6                                    2     16.6      4.0
  WSW       8.3    8.3                                    2     16.6      3.1
    W                     8.3                             1      8.3      7.1
  WNW              8.3                                    1      8.3      5.7
   NW                                                     0      0.0
  NNW                                                     0      0.0

 CALM                                                     0      0.0

L. TOTALS  33.2   58.1    8.3                            12               3.6

00 METER LEVEL WINDS AFTERNOON            MAY,1978

DIRECTION    ********* WIND SPEEDS METERS/SECOND ******************************
           00.1   03.0   06.0   10.0   16.0  GREATER      ROW   SUMMARY
            TO     TO     TO     TO     TO     THAN     TOTAL   TOTAL  AVERAGE
           02.9   05.9   09.9   15.9   25.0    25.0     COUNT  PERCENT  SPEED

    N                     9.0                             1      9.0      6.5
  NNE                                                     0      0.0
   NE       9.0          18.1                             3     27.1      5.8
  ENE                                                     0      0.0
    E                                                     0      0.0
  ESE                                                     0      0.0
   SE                                                     0      0.0
  SSE              9.0                                    1      9.0      4.8
    S                                                     0      0.0
  SSW                                                     0      0.0
   SW                                                     0      0.0
  WSW                                                     0      0.0
    W                    18.1   18.1                      4     36.2      9.8
  WNW                                  9.0                1      9.0     23.2
   NW                                                     0      0.0
  NNW       9.0                                           1      9.0      2.9

 CALM                                                     0      0.0

L. TOTALS  18.0    9.0   45.2   18.1   9.0               11               8.7
```

```
                    FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
 200 METER LEVEL WINDS MORNING          MAY,1978
  DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
               00.1   03.0   06.0   10.0   16.0  GREATER      ROW   SUMMARY
                TO     TO     TO     TO     TO    THAN       TOTAL   TOTAL   AVERAGE
               02.9   05.9   09.9   15.9   25.0   25.0       COUNT  PERCENT   SPEED

        N                                                      0      0.0
      NNE                                                      0      0.0
       NE       8.3                                            1      8.3       2.2
      ENE       8.3                                            1      8.3       1.2
        E                                                      0      0.0
      ESE                                                      0      0.0
       SE                                                      0      0.0
      SSE       8.3                                            1      8.3       2.5
        S              8.3                                     1      8.3       4.8
      SSW                     8.3                              1      8.3       8.5
       SW              8.3                                     1      8.3       3.3
      WSW              8.3                                     1      8.3       3.6
        W       8.3                  8.3                       2     16.6       6.4
      WNW       8.3                  8.3                       2     16.6       6.6
       NW              8.3                                     1      8.3       4.8
      NNW                                                      0      0.0

     CALM                                                      0      0.0

 COL. TOTALS   41.6   33.2    8.3   16.6                      12                4.7
 200 METER LEVEL WINDS AFTERNOON        MAY,1978

  DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
               00.1   03.0   06.0   10.0   16.0  GREATER      ROW   SUMMARY
                TO     TO     TO     TO     TO    THAN       TOTAL   TOTAL   AVERAGE
               02.9   05.9   09.9   15.9   25.0   25.0       COUNT  PERCENT   SPEED

        N                     9.0                              1      9.0       8.5
      NNE       9.0                                            1      9.0       2.2
       NE              9.0    9.0                              2     18.0       6.8
      ENE                                                      0      0.0
        E                                                      0      0.0
      ESE                                                      0      0.0
       SE              9.0                                     1      9.0       5.7
      SSE                                                      0      0.0
        S                                                      0      0.0
      SSW                                                      0      0.0
       SW                                                      0      0.0
      WSW                            9.0                       1      9.0      10.5
        W                    18.1    9.0    9.0                4     36.1      11.3
      WNW                                                      0      0.0
       NW       9.0                                            1      9.0       2.4
      NNW                                                      0      0.0

     CALM                                                      0      0.0

 COL. TOTALS   18.0   18.0   36.1   18.0    9.0               11                8.0
```

FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

CCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

00 METER LEVEL WINDS MORNING MAY,1978

| DIRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| N | | | | | | | 0 | 0.0 | |
| NNE | | 8.3 | | | | | 1 | 8.3 | 3.5 |
| NE | | | | | | | 0 | 0.0 | |
| ENE | 8.3 | | | | | | 1 | 8.3 | 1.3 |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | 8.3 | | | | | | 1 | 8.3 | 1.6 |
| S | | 8.3 | | | | | 1 | 8.3 | 3.5 |
| SSW | | | 8.3 | 8.3 | | | 2 | 16.6 | 10.5 |
| SW | | | | | | | 0 | 0.0 | |
| WSW | | | 8.3 | | | | 1 | 8.3 | 7.4 |
| W | | | | | | | 0 | 0.0 | |
| WNW | 8.3 | 8.3 | 16.6 | | | | 4 | 33.2 | 6.5 |
| NW | 8.3 | | | | | | 1 | 8.3 | 2.0 |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| L. TOTALS | 33.2 | 24.9 | 33.2 | 8.3 | | | 12 | | 5.5 |

00 METER LEVEL WINDS AFTERNOON MAY,1978

| DIRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| N | 9.0 | 9.0 | | | | | 2 | 18.0 | 2.1 |
| NNE | | | | 9.0 | | | 1 | 9.0 | 10.7 |
| NE | | 9.0 | | | | | 1 | 9.0 | 5.7 |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | 9.0 | | | | | 1 | 9.0 | 3.1 |
| S | | | | | | | 0 | 0.0 | |
| SSW | | | | | | | 0 | 0.0 | |
| SW | | | | | | | 0 | 0.0 | |
| WSW | | | 9.0 | | | | 1 | 9.0 | 9.1 |
| W | | | | | | 9.0 | 1 | 9.0 | 37.7 |
| WNW | | 9.0 | 9.0 | 9.0 | | | 3 | 27.0 | 8.7 |
| NW | 9.0 | | | | | | 1 | 9.0 | 2.8 |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| L. TOTALS | 18.0 | 36.0 | 18.0 | 18.0 | | 9.0 | 11 | | 9.0 |

```
                  FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

500 METER LEVEL WINDS MORNING          MAY,1978

 DIRECTION   ******** WIND SPEEDS METERS/SECOND ****************************
             00.1  03.0  06.0  10.0  16.0  GREATER          ROW  SUMMARY
              TO    TO    TO    TO    TO     THAN       TOTAL   TOTAL  AVERAGE
             02.9  05.9  09.9  15.9  25.0    25.0       COUNT  PERCENT  SPEED

        N                                                   0    0.0
      NNE           8.3                                     1    8.3     4.9
       NE     8.3                                           1    8.3     2.3
      ENE                                                   0    0.0
        E                                                   0    0.0
      ESE                                                   0    0.0
       SE                                                   0    0.0
      SSE     8.3                                           1    8.3     1.0
        S     8.3                                           1    8.3     2.7
      SSW           8.3                                     1    8.3     4.9
       SW                 8.3                               1    8.3     6.4
      WSW                 8.3                               1    8.3     7.0
        W                                                   0    0.0
      WNW     8.3   8.3   8.3   8.3                         4   33.2     6.5
       NW                 8.3                               1    8.3     9.9
      NNW                                                   0    0.0

     CALM                                                   0    0.0

COL. TOTALS  33.2  24.9  33.2   8.3                        12            5.4

500 METER LEVEL WINDS AFTERNOON        MAY,1978

 DIRECTION   ******** WIND SPEEDS METERS/SECOND ****************************
             00.1  03.0  06.0  10.0  16.0  GREATER          ROW  SUMMARY
              TO    TO    TO    TO    TO     THAN       TOTAL   TOTAL  AVERAGE
             02.9  05.9  09.9  15.9  25.0    25.0       COUNT  PERCENT  SPEED

        N                                                   0    0.0
      NNE                18.1   9.0                         3   27.1     8.2
       NE                                                   0    0.0
      ENE                                                   0    0.0
        E                                                   0    0.0
      ESE                                                   0    0.0
       SE     9.0                                           1    9.0     2.6
      SSE                                                   0    0.0
        S                                                   0    0.0
      SSW                                                   0    0.0
       SW                                                   0    0.0
      WSW                       9.0                         1    9.0    14.0
        W     9.0   9.0                       9.0           3   27.0    16.4
      WNW     9.0         9.0                               2   18.0     6.1
       NW           9.0                                     1    9.0     4.5
      NNW                                                   0    0.0

     CALM                                                   0    0.0

COL. TOTALS  27.0  18.0  27.1  18.0           9.0          11            9.7
```

```
                 FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

OCATION: DEER LODGE CC - HIWAY JUNCTION - MET (MAPS)

50 METER LEVEL WINDS MORNING            MAY,1978

DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
              00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
               TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
              02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

     N                                                          0     0.0
   NNE               8.3                                        1     8.3      3.1
    NE               8.3                                        1     8.3      3.7
   ENE                                                          0     0.0
     E                                                          0     0.0
   ESE                                                          0     0.0
    SE                                                          0     0.0
   SSE        8.3                                               1     8.3      1.1
     S                                                          0     0.0
   SSW                                                          0     0.0
    SW               8.3    8.3                                 2    16.6      6.8
   WSW              16.6                                        2    16.6      5.4
     W              16.6                                        2    16.6      4.5
   WNW                     16.6                                 2    16.6      8.6
    NW                      8.3                                 1     8.3      6.9
   NNW                                                          0     0.0

  CALM                                                          0     0.0

L. TOTALS     8.3   58.1   33.2                                12              5.4

50 METER LEVEL WINDS AFTERNOON          MAY,1978

DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
              00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
               TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
              02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

     N       11.1                                               1    11.1      1.5
   NNE                     11.1                                 1    11.1      6.7
    NE                                                          0     0.0
   ENE                                                          0     0.0
     E                                                          0     0.0
   ESE                                                          0     0.0
    SE                                                          0     0.0
   SSE                                                          0     0.0
     S                                                          0     0.0
   SSW                                                          0     0.0
    SW                                                          0     0.0
   WSW              11.1                                        1    11.1      4.6
     W                     11.1          11.1     11.1          3    33.3     25.4
   WNW                     11.1                                 1    11.1      8.4
    NW              11.1   11.1                                 2    22.2      5.6
   NNW                                                          0     0.0

  CALM                                                          0     0.0

L. TOTALS    11.1   22.2   44.4          11.1     11.1          9             12.0
```

```
              FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
  LOCATION: DEER LODGE CC - HIWAY JUNCTION - MET (MAPS)
   300 METER LEVEL WINDS MORNING          MAY,1978
    DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
                 00.1  03.0  06.0  10.0  16.0  GREATER      ROW  SUMMARY
                  TO    TO    TO    TC    TC    THAN     TOTAL  TOTAL  AVERAGE
                 02.9  05.9  09.9  15.9  25.0   25.0     COUNT  PERCENT SPEED

         N                                                   0     0.0
       NNE                                                   0     0.0
        NE                                                   0     0.0
       ENE              8.3                                  1     8.3      4.1
         E        8.3                                        1     8.3      2.1
       ESE                                                   0     0.0
        SE                                                   0     0.0
       SSE                                                   0     0.0
         S                                                   0     0.0
       SSW                                                   0     0.0
        SW                    8.3  16.6                      3    24.9     11.4
       WSW              8.3                                  1     8.3      3.9
         W                    8.3                            1     8.3      9.3
       WNW                                                   0     0.0
        NW             16.6   8.3   8.3                      4    33.2      6.8
       NNW        8.3                                        1     8.3      2.6

      CALM                                                   0     0.0

  COL. TOTALS    16.6  33.2  24.9  24.9                     12              6.9
   300 METER LEVEL WINDS AFTERNOON        MAY,1978

    DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
                 00.1  03.0  06.0  10.0  16.0  GREATER      ROW  SUMMARY
                  TO    TO    TO    TC    TO    THAN     TOTAL  TOTAL  AVERAGE
                 02.9  05.9  09.9  15.9  25.0   25.0     COUNT  PERCENT SPEED

         N                                                   0     0.0
       NNE             14.2                                  1    14.2      5.8
        NE                                                   0     0.0
       ENE                                                   0     0.0
         E                                                   0     0.0
       ESE                                                   0     0.0
        SE                                                   0     0.0
       SSE                                                   0     0.0
         S                                                   0     0.0
       SSW                                                   0     0.0
        SW                                                   0     0.0
       WSW                                                   0     0.0
         W             14.2                     14.2         2    28.4     25.9
       WNW       14.2  14.2                                  2    28.4      3.5
        NW             28.5                                  2    28.5      5.5
       NNW                                                   0     0.0

      CALM                                                   0     0.0

  COL. TOTALS    14.2  71.1                     14.2         7             10.8
```

```
          FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

CCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

00 METER LEVEL WINDS MORNING          MAY,1978

DIRECTION  ********* WIND SPEEDS METERS/SECOND ****************************
           00.1  03.0  06.0  10.0  16.0  GREATER      ROW  SUMMARY
            TO    TO    TO    TO    TO    THAN     TOTAL    TOTAL  AVERAGE
           02.9  05.9  09.9  15.9  25.0   25.0     COUNT  PERCENT   SPEED

    N                  18.1                            2    18.1      9.3
  NNE                                                  0     0.0
   NE                                                  0     0.0
  ENE                                                  0     0.0
    E                   9.0                            1     9.0      6.7
  ESE                                                  0     0.0
   SE                                                  0     0.0
  SSE                                                  0     0.0
    S                                                  0     0.0
  SSW                         9.0                      1     9.0     12.2
   SW                         9.0                      1     9.0     12.3
  WSW                   9.0                            1     9.0      6.0
    W             9.0   9.0   9.0                      3    27.0      8.3
  WNW                                                  0     0.0
   NW                                                  0     0.0
  NNW             9.0         9.0                      2    18.0      8.5

 CALM                                                  0     0.0

L. TOTALS        18.0  45.1  36.0                     11              8.9

00 METER LEVEL WINDS AFTERNOON        MAY,1978

DIRECTION  ********* WIND SPEEDS METERS/SECOND ****************************
           00.1  03.0  06.0  10.0  16.0  GREATER      ROW  SUMMARY
            TO    TO    TO    TO    TO    THAN     TOTAL    TOTAL  AVERAGE
           02.9  05.9  09.9  15.9  25.0   25.0     COUNT  PERCENT   SPEED

    N                  16.6                            1    16.6      7.4
  NNE                                                  0     0.0
   NE                                                  0     0.0
  ENE                                                  0     0.0
    E                                                  0     0.0
  ESE                                                  0     0.0
   SE                                                  0     0.0
  SSE                                                  0     0.0
    S                                                  0     0.0
  SSW                                                  0     0.0
   SW                                                  0     0.0
  WSW            16.6                                  1    16.6      4.5
    W                              16.6   33.3         3    49.9     37.5
  WNW                                                  0     0.0
   NW            16.6                                  1    16.6      5.8
  NNW                                                  0     0.0

 CALM                                                  0     0.0

L. TOTALS        33.2  16.6        16.6   33.3         6             21.7
```

```
                 FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
   LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
  2000 METER LEVEL WINDS MORNING          MAY,1978
     DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
                  00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
                   TO     TO     TO     TO     TO     THAN      TOTAL    TOTAL   AVERAGE
                  02.9   05.9   09.9   15.9   25.0    25.0      COUNT   PERCENT   SPEED

          N                                                        0       0.0
        NNE                                                        0       0.0
         NE                                                        0       0.0
        ENE                                                        0       0.0
          E                            14.2                        1      14.2      12.3
        ESE                                                        0       0.0
         SE                                                        0       0.0
        SSE                                                        0       0.0
          S                                                        0       0.0
        SSW                            14.2                        1      14.2      15.8
         SW                            28.5                        2      28.5      15.0
        WSW                                                        0       0.0
          W                            14.2   14.2                 2      28.4      16.4
        WNW                                                        0       0.0
         NW                                                        0       0.0
        NNW                            14.2                        1      14.2      15.3

       CALM                                                        0       0.0

  COL. TOTALS                          85.3   14.2                 7                15.1
  2000 METER LEVEL WINDS AFTERNOON        MAY,1978

     DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
                  00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
                   TO     TO     TO     TO     TO     THAN      TOTAL    TOTAL   AVERAGE
                  02.9   05.9   09.9   15.9   25.0    25.0      COUNT   PERCENT   SPEED

          N                                                        0       0.0
        NNE                                                        0       0.0
         NE                                                        0       0.0
        ENE                                   25.0                 1      25.0      16.8
          E                                                        0       0.0
        ESE                                                        0       0.0
         SE                                                        0       0.0
        SSE                                                        0       0.0
          S                                                        0       0.0
        SSW                                                        0       0.0
         SW                                                        0       0.0
        WSW                                                        0       0.0
          W                     25.0                 50.0          3      75.0      28.7
        WNW                                                        0       0.0
         NW                                                        0       0.0
        NNW                                                        0       0.0

       CALM                                                        0       0.0

  COL. TOTALS                   25.0          25.0   50.0          4                25.7
```

```
                FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
00 METER LEVEL WINDS MORNING            MAY,1978
DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW    SUMMARY
              TO     TO     TO     TO     TO     THAN       TOTAL    TOTAL   AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0       COUNT   PERCENT   SPEED

    N                                                         0       0.0
  NNE                                                         0       0.0
   NE                                                         0       0.0
  ENE                                                         0       0.0
    E                                                         0       0.0
  ESE                                                         0       0.0
   SE                                                         0       0.0
  SSE                                                         0       0.0
    S                                                         0       0.0
  SSW                                                         0       0.0
   SW                                                         0       0.0
  WSW                                                         0       0.0
    W                       50.0          50.0                2     100.0      12.6
  WNW                                                         0       0.0
   NW                                                         0       0.0
  NNW                                                         0       0.0

 CALM                                                         0       0.0

L. TOTALS                   50.0          50.0                2                12.6
00 METER LEVEL WINDS AFTERNOON          MAY,1978
DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW    SUMMARY
              TO     TO     TO     TO     TO     THAN       TOTAL    TOTAL   AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0       COUNT   PERCENT   SPEED

    N                                                         0       0.0
  NNE                                                         0       0.0
   NE                                                         0       0.0
  ENE                                                         0       0.0
    E                                                         0       0.0
  ESE                                                         0       0.0
   SE                                                         0       0.0
  SSE                                                         0       0.0
    S                                                         0       0.0
  SSW                                                         0       0.0
   SW                                                         0       0.0
  WSW                                                         0       0.0
    W                              50.0          50.0         2     100.0      24.1
  WNW                                                         0       0.0
   NW                                                         0       0.0
  NNW                                                         0       0.0

 CALM                                                         0       0.0

L. TOTALS                          50.0          50.0         2                24.1
```

```
                   FREQUENCY SUMMARY OF MIXING HEIGHTS

     LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

    MIXING HEIGHTS -FREQUENCY OF OCCURENCE FOR        MAY  1978

  MIXING HEIGHT         MORNING              AFTERNOON
   (METERS)            OCCURENCES            OCCURENCES

        0- 100              0                     0

      101- 250              0                     0

      251- 500              0                     0

      501- 750              0                     0

      751-1000              0                     0

     1001-1500              0                     0

         >1500              0                     0

         TOTAL              0                     0


   AVERAGE WIND SPEED
   THROUGH MIXED
   LAYER (M/SEC)          0.0                   0.0


   AVERAGE LAPSE RATE
   BELOW FIRST INVER.
      (DEG C /100M)   -00.00                -00.00
```

```
                FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
CATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

       SURFACE WINDS MORNING         JUNE,1978

DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
            00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
             TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
            02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

     N                                                       0      0.0
   NNE                                                       0      0.0
    NE                                                       0      0.0
   ENE                                                       0      0.0
     E       4.5                                             1      4.5        .9
   ESE                                                       0      0.0
    SE                                                       0      0.0
   SSE       4.5                                             1      4.5       1.8
     S       4.5    4.5                                      2      9.0       2.0
   SSW       4.5    4.5                                      2      9.0       3.6
    SW              4.5                                      1      4.5       3.3
   WSW       4.5   13.6                                      4     18.1       3.4
     W      18.1   22.7                                      9     40.8       2.6
   WNW       9.0                                             2      9.0       1.5
    NW                                                       0      0.0
   NNW                                                       0      0.0

  CALM                                                       0      0.0

L. TOTALS   49.6   49.8                                     22                2.6

       SURFACE WINDS AFTERNOON       JUNE,1978

DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
            00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
             TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
            02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

     N       5.5                                             1      5.5       2.7
   NNE      11.1    5.5                                      3     16.6       2.5
    NE                                                       0      0.0
   ENE              5.5                                      1      5.5       3.1
     E       5.5    5.5                                      2     11.0       2.9
   ESE                                                       0      0.0
    SE                     5.5                               1      5.5       6.3
   SSE                                                       0      0.0
     S       5.5                                             1      5.5       2.7
   SSW       5.5    5.5    5.5                               3     16.5       4.3
    SW                    11.1                               2     11.1       7.3
   WSW                                                       0      0.0
     W                                                       0      0.0
   WNW             11.1    5.5                               3     16.6       6.1
    NW              5.5                                      1      5.5       5.4
   NNW                                                       0      0.0

  CALM                                                       0      0.0

L. TOTALS   33.1   38.6   27.6                              18                4.4
```

```
                   FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
  LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
  100 METER LEVEL WINDS MORNING          JUNE,1978
   DIRECTION   ********* WIND SPEEDS METERS/SECOND *************************
                 00.1   03.0   06.0   10.0   16.0   GREATER      ROW    SUMMARY
                  TO     TO     TO     TO     TO     THAN       TOTAL    TOTAL   AVERAGE
                 02.9   05.9   09.9   15.9   25.0    25.0       COUNT   PERCENT   SPEED

         N        4.5    4.5                                       2       9.0      3.0
       NNE                                                         0       0.0
        NE                                                         0       0.0
       ENE                                                         0       0.0
         E                                                         0       0.0
       ESE                                                         0       0.0
        SE        4.5                                              1       4.5       .8
       SSE        4.5                                              1       4.5      1.9
         S               9.0                                       2       9.0      4.9
       SSW               4.5                                       1       4.5      3.5
        SW        4.5   31.8    4.5                                9      40.8      4.1
       WSW        4.5           4.5                                2       9.0      4.1
         W        9.0                                              2       9.0      1.6
       WNW                                                         0       0.0
        NW               4.5                                       1       4.5      5.7
       NNW        4.5                                              1       4.5      1.6

      CALM                                                         0       0.0

 COL. TOTALS     36.0   54.3    9.0                               22                3.5
  100 METER LEVEL WINDS AFTERNOON        JUNE,1978
   DIRECTION   ********* WIND SPEEDS METERS/SECOND *************************
                 00.1   03.0   06.0   10.0   16.0   GREATER      ROW    SUMMARY
                  TO     TO     TO     TO     TO     THAN       TOTAL    TOTAL   AVERAGE
                 02.9   05.9   09.9   15.9   25.0    25.0       COUNT   PERCENT   SPEED

         N        5.5    5.5                                       2      11.0      3.1
       NNE        5.5                                              1       5.5      1.3
        NE              16.6                                       3      16.6      3.9
       ENE                                                         0       0.0
         E                                                         0       0.0
       ESE                                                         0       0.0
        SE        5.5                  5.5                         2      11.0      6.2
       SSE                                                         0       0.0
         S                                                         0       0.0
       SSW              11.1    5.5                                3      16.6      5.4
        SW              11.1                                       2      11.1      5.4
       WSW                                                         0       0.0
         W        5.5           5.5                                2      11.0      3.9
       WNW               5.5           5.5                         2      11.0      8.7
        NW               5.5                                       1       5.5      5.5
       NNW                                                         0       0.0

      CALM                                                         0       0.0

 COL. TOTALS     22.0   55.3   11.0   11.0                        18                4.9
```

```
          FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

00 METER LEVEL WINDS MORNING          JUNE.1978

DIRECTION  ********** WIND SPEEDS METERS/SECOND ****************************
             00.1   03.0   06.0   10.0   16.0 GREATER      ROW   SUMMARY
               TO     TO     TO     TO     TO    THAN    TOTAL     TOTAL  AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0    COUNT   PERCENT    SPEED

         N           9.0                                     2       9.0      4.5
       NNE                                                   0       0.0
        NE                                                   0       0.0
       ENE    4.5                                            1       4.5       .4
         E    4.5                                            1       4.5       .9
       ESE                                                   0       0.0
        SE    4.5                                            1       4.5       .8
       SSE                                                   0       0.0
         S           4.5    9.0                              3      13.5      6.0
       SSW           4.5                                     1       4.5      4.2
        SW    4.5    9.0                                     3      13.5      3.5
       WSW    9.0    4.5                                     3      13.5      3.7
         W   13.6    9.0                                     5      22.6      2.4
       WNW                                                   0       0.0
        NW    4.5    4.5                                     2       9.0      2.3
       NNW                                                   0       0.0

      CALM                                                   0       0.0

OL. TOTALS   45.1   45.0    9.0                             22                3.2

200 METER LEVEL WINDS AFTERNOON       JUNE.1978

DIRECTION  ********** WIND SPEEDS METERS/SECOND ****************************
             00.1   03.0   06.0   10.0   16.0 GREATER      ROW   SUMMARY
               TO     TO     TO     TO     TO    THAN    TOTAL     TOTAL  AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0    COUNT   PERCENT    SPEED

         N    5.5                                            1       5.5      2.3
       NNE    5.5    5.5           5.5                       3      16.5      6.2
        NE           5.5    5.5                              2      11.0      6.8
       ENE                                                   0       0.0
         E                                                   0       0.0
       ESE                                                   0       0.0
        SE                         5.5                       1       5.5     15.4
       SSE           5.5                                     1       5.5      3.0
         S                                                   0       0.0
       SSW          11.1                                     2      11.1      4.2
        SW           5.5           5.5    5.5                3      16.5     12.2
       WSW                                                   0       0.0
         W    5.5                                            1       5.5      1.3
       WNW           5.5    5.5           5.5                3      16.5      9.5
        NW    5.5                                            1       5.5      1.8
       NNW                                                   0       0.0

      CALM                                                   0       0.0

OL. TOTALS   22.0   38.6   11.0   16.5   11.0               18                7.2
```

```
                  FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
  300 METER LEVEL WINDS MORNING          JUNE,1978
   DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
                00.1   03.0   06.0   10.0   16.0   GREATER     ROW   SUMMARY
                 TO     TO     TO     TO     TO     THAN     TOTAL   TOTAL  AVERAGE
                02.9   05.9   09.9   15.9   25.0    25.0     COUNT  PERCENT  SPEED

         N       4.5                                            1      4.5     1.5
       NNE                                                      0      0.0
        NE                                                      0      0.0
       ENE                                                      0      0.0
         E       4.5                                            1      4.5      .9
       ESE                                                      0      0.0
        SE                                                      0      0.0
       SSE       4.5                                            1      4.5     1.5
         S       4.5           9.0    4.5                       4     18.0     6.7
       SSW              9.0                                     2      9.0     3.9
        SW      13.6    4.5                                     4     18.1     2.5
       WSW       4.5    4.5                                     2      9.0     2.0
         W       4.5    4.5                                     2      9.0     2.9
       WNW              9.0                                     2      9.0     5.4
        NW       4.5    4.5                                     2      9.0     2.9
       NNW       4.5                                            1      4.5     1.5

      CALM                                                      0      0.0

 COL. TOTALS    49.6   36.0    9.0    4.5                      22              3.5
  300 METER LEVEL WINDS AFTERNOON        JUNE,1978
   DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
                00.1   03.0   06.0   10.0   16.0   GREATER     ROW   SUMMARY
                 TO     TO     TO     TO     TO     THAN     TOTAL   TOTAL  AVERAGE
                02.9   05.9   09.9   15.9   25.0    25.0     COUNT  PERCENT  SPEED

         N              5.5                                     1      5.5     4.9
       NNE       5.5                                            1      5.5     2.4
        NE       5.5   11.1                                     3     16.6     4.4
       ENE                                                      0      0.0
         E                                                      0      0.0
       ESE                                                      0      0.0
        SE                                                      0      0.0
       SSE                     5.5                              1      5.5     7.6
         S       5.5                                            1      5.5     2.7
       SSW                                   5.5                1      5.5    22.4
        SW       5.5    5.5           5.5                       3     16.5     7.8
       WSW              5.5                                     1      5.5     3.0
         W       5.5           5.5                              2     11.0     5.3
       WNW       5.5    5.5    5.5                              3     16.5     4.7
        NW                                                      0      0.0
       NNW       5.5                                            1      5.5     2.8

      CALM                                                      0      0.0

 COL. TOTALS    38.5   33.1   16.5    5.5    5.5               18              5.9
```

FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

00 METER LEVEL WINDS MORNING JUNE,1978

| DIRECTION | ********* WIND SPEEDS METERS/SECOND | | | | | ************************** | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
| N | | | | | | | 0 | 0.0 | |
| NNE | 4.5 | | | | | | 1 | 4.5 | 2.5 |
| NE | 4.5 | | | | | | 1 | 4.5 | 1.0 |
| ENE | 4.5 | | | | | | 1 | 4.5 | .7 |
| E | 4.5 | | | | | | 1 | 4.5 | 1.3 |
| ESE | | | | | | | 0 | 0.0 | |
| SE | 4.5 | | | | | | 1 | 4.5 | 2.6 |
| SSE | | | | | | | 0 | 0.0 | |
| S | | 4.5 | 9.0 | | | | 3 | 13.5 | 5.8 |
| SSW | 4.5 | | 4.5 | | | | 2 | 9.0 | 5.1 |
| SW | | 4.5 | | 4.5 | | | 2 | 9.0 | 9.7 |
| WSW | | | | | | | 0 | 0.0 | |
| W | 4.5 | 9.0 | 13.6 | | | | 6 | 27.1 | 5.8 |
| WNW | | 4.5 | | | | | 1 | 4.5 | 4.7 |
| NW | 4.5 | 4.5 | 4.5 | | | | 3 | 13.5 | 5.0 |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| L. TOTALS | 36.0 | 27.0 | 31.6 | 4.5 | | | 22 | | 5.0 |

00 METER LEVEL WINDS AFTERNOON JUNE,1978

| DIRECTION | ********* WIND SPEEDS METERS/SECOND | | | | | ************************** | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
| N | | | | | | | 0 | 0.0 | |
| NNE | 5.5 | 5.5 | | | | | 2 | 11.0 | 4.0 |
| NE | | | 5.5 | | | | 1 | 5.5 | 9.3 |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | 5.5 | | | | 1 | 5.5 | 8.2 |
| S | 5.5 | 5.5 | 5.5 | | | | 3 | 16.5 | 4.4 |
| SSW | | | | | 5.5 | | 1 | 5.5 | 17.3 |
| SW | 11.1 | 5.5 | | 5.5 | | | 4 | 22.1 | 5.6 |
| WSW | | 5.5 | | | | | 1 | 5.5 | 5.9 |
| W | | | | | | | 0 | 0.0 | |
| WNW | | 16.6 | 5.5 | | 5.5 | | 5 | 27.6 | 8.4 |
| NW | | | | | | | 0 | 0.0 | |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| L. TOTALS | 22.1 | 38.6 | 22.0 | 5.5 | 11.0 | | 18 | | 7.0 |

## FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

750 METER LEVEL WINDS MORNING JUNE,1978

| DIRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| | ******** WIND SPEEDS METERS/SECOND ******** | | | | | | | | |
| N | | | | | | | 0 | 0.0 | |
| NNE | | 5.0 | | | | | 1 | 5.0 | 4.2 |
| NE | | | | | | | 0 | 0.0 | |
| ENE | 5.0 | | | | | | 1 | 5.0 | .8 |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | 20.0 | 5.0 | | | | | 5 | 25.0 | 2.2 |
| S | | | 5.0 | | | | 1 | 5.0 | 8.3 |
| SSW | | | | 10.0 | | | 2 | 10.0 | 12.0 |
| SW | | | 5.0 | | | | 1 | 5.0 | 9.5 |
| WSW | | | | | | | 0 | 0.0 | |
| W | 5.0 | 10.0 | 10.0 | 10.0 | | | 7 | 35.0 | 6.6 |
| WNW | | | 10.0 | | | | 2 | 10.0 | 7.4 |
| NW | | | | | | | 0 | 0.0 | |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 30.0 | 20.0 | 30.0 | 20.0 | | | 20 | | 5.9 |

750 METER LEVEL WINDS AFTERNOON JUNE,1978

| DIRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| | ******** WIND SPEEDS METERS/SECOND ******** | | | | | | | | |
| N | | | | | | | 0 | 0.0 | |
| NNE | | | 11.1 | | | | 2 | 11.1 | 8.8 |
| NE | | | | | | | 0 | 0.0 | |
| ENE | 5.5 | | | | | | 1 | 5.5 | 2.9 |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | 5.5 | | 5.5 | | | | 2 | 11.0 | 4.6 |
| SSE | | | | | | | 0 | 0.0 | |
| S | 5.5 | | 5.5 | | | | 2 | 11.0 | 4.9 |
| SSW | | | 5.5 | | 5.5 | | 2 | 11.0 | 15.9 |
| SW | 5.5 | | 5.5 | | | | 2 | 11.0 | 4.6 |
| WSW | | | | | | | 0 | 0.0 | |
| W | | | 5.5 | | | | 1 | 5.5 | 8.4 |
| WNW | 5.5 | 11.1 | 5.5 | | | 5.5 | 5 | 27.6 | 10.7 |
| NW | | | 5.5 | | | | 1 | 5.5 | 7.5 |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 27.5 | 11.1 | 49.6 | | 5.5 | 5.5 | 18 | | 8.3 |

```
             FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

OCATION: DEER LODGE CC - HIWAY JUNCTION - MET (MAPS)

) METER LEVEL WINDS MORNING         JUNE,1978

DIRECTION  ********* WIND SPEEDS METERS/SECOND *************************
            00.1  03.0  06.0  10.0  16.0  GREATER    ROW   SUMMARY
             TO    TO    TO    TO    TO    THAN   TOTAL   TOTAL  AVERAGE
            02.9  05.9  09.9  15.9  25.0   25.0   COUNT PERCENT  SPEED

    N        5.0                                      1     5.0     1.8
  NNE                                                 0     0.0
   NE        5.0                                      1     5.0     1.9
  ENE                                                 0     0.0
    E                                                 0     0.0
  ESE                                                 0     0.0
   SE                    5.0                          1     5.0     8.4
  SSE        5.0        10.0                          3    15.0     5.1
    S              5.0                                1     5.0     5.1
  SSW                                5.0              1     5.0    16.2
   SW        5.0         5.0   5.0                    3    15.0     7.8
  WSW              5.0                                1     5.0     4.9
    W             10.0  10.0   5.0                    5    25.0     8.1
  WNW                    5.0   5.0                    2    10.0     9.4
   NW              5.0                                1     5.0     5.3
  NNW                                                 0     0.0

 CALM                                                 0     0.0

L. TOTALS   20.0  25.0  35.0  15.0   5.0             20             7.1

) METER LEVEL WINDS AFTERNOON       JUNE,1978

DIRECTION  ********* WIND SPEEDS METERS/SECOND *************************
            00.1  03.0  06.0  10.0  16.0  GREATER    ROW   SUMMARY
             TO    TO    TO    TO    TO    THAN   TOTAL   TOTAL  AVERAGE
            02.9  05.9  09.9  15.9  25.0   25.0   COUNT PERCENT  SPEED

    N                          5.5                    1     5.5    14.4
  NNE                                                 0     0.0
   NE        5.5                                      1     5.5     2.3
  ENE              5.5                                1     5.5     3.5
    E                                                 0     0.0
  ESE                                                 0     0.0
   SE                          5.5                    1     5.5    10.6
  SSE                                                 0     0.0
    S              5.5                                1     5.5     4.7
  SSW                    5.5                 5.5      2    11.0    17.6
   SW              5.5   5.5                          2    11.0     7.0
  WSW        5.5   5.5                                2    11.0     2.5
    W        5.5         5.5                          2    11.0     5.0
  WNW                    5.5  11.1                    3    16.6    10.3
   NW              5.5                                1     5.5     5.2
  NNW                    5.5                          1     5.5     6.3

 CALM                                                 0     0.0

L. TOTALS   16.5  27.5  27.5  22.1               5.5     18             7.9
```

FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

1500 METER LEVEL WINDS MORNING JUNE,1978

| DIRECTION | ******** WIND SPEEDS METERS/SECOND ******** | | | | | | ROW SUMMARY | | |
|---|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | TOTAL COUNT | TOTAL PERCENT | AVERAGE SPEED |
| N | | | | | | | 0 | 0.0 | |
| NNE | | | | | | | 0 | 0.0 | |
| NE | | 5.2 | | | | | 1 | 5.2 | 4.7 |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | 5.2 | | | | 1 | 5.2 | 7.9 |
| S | | | 5.2 | | | | 1 | 5.2 | 6.9 |
| SSW | | | 10.5 | | | | 2 | 10.5 | 8.3 |
| SW | | | 5.2 | | 5.2 | | 2 | 10.4 | 15.8 |
| WSW | | | 5.2 | | | | 1 | 5.2 | 7.2 |
| W | | 5.2 | 10.5 | | | | 3 | 15.7 | 6.3 |
| WNW | 5.2 | 5.2 | 5.2 | 5.2 | 5.2 | | 5 | 26.0 | 8.1 |
| NW | | | 10.5 | | | | 2 | 10.5 | 7.4 |
| NNW | | | 5.2 | | | | 1 | 5.2 | 6.8 |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 5.2 | 15.6 | 62.7 | 5.2 | 10.4 | | 19 | | 8.2 |

1500 METER LEVEL WINDS AFTERNOON JUNE,1978

| DIRECTION | ******** WIND SPEEDS METERS/SECOND ******** | | | | | | ROW SUMMARY | | |
|---|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | TOTAL COUNT | TOTAL PERCENT | AVERAGE SPEED |
| N | | | | | | | 0 | 0.0 | |
| NNE | | | | | | | 0 | 0.0 | |
| NE | 5.5 | | | | | | 1 | 5.5 | 1.2 |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | 5.5 | | | 5.5 | | 2 | 11.0 | 11.1 |
| SSE | | | | | | | 0 | 0.0 | |
| S | | | | | | | 0 | 0.0 | |
| SSW | 5.5 | | | 5.5 | 5.5 | | 3 | 16.5 | 12.5 |
| SW | 5.5 | 5.5 | | | | | 2 | 11.0 | 2.6 |
| WSW | | 5.5 | 5.5 | 5.5 | | | 3 | 16.5 | 9.0 |
| W | | | 16.6 | | | | 3 | 16.6 | 6.5 |
| WNW | 5.5 | | | 5.5 | | | 2 | 11.0 | 8.0 |
| NW | | | | | 5.5 | | 1 | 5.5 | 16.2 |
| NNW | | 5.5 | | | | | 1 | 5.5 | 3.1 |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 22.0 | 22.0 | 22.1 | 16.5 | 16.5 | | 18 | | 8.2 |

```
               FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

00 METER LEVEL WINDS MORNING          JUNE,1978

 DIRECTION   ******** WIND SPEEDS METERS/SECOND ******************************
             00.1   03.0   06.0   10.0   16.0   GREATER        ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN        TOTAL   TOTAL  AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0        COUNT  PERCENT  SPEED

     N                                                         0      0.0
   NNE                                                         0      0.0
    NE             5.5                                         1      5.5      5.9
   ENE                                                         0      0.0
     E                                                         0      0.0
   ESE                                                         0      0.0
    SE                                                         0      0.0
   SSE                                                         0      0.0
     S                    5.5    5.5                           2     11.0      9.6
   SSW             5.5    5.5    5.5                           3     16.5      8.3
    SW                           5.5                           1      5.5     13.6
   WSW             5.5           5.5   11.1                    4     22.1     14.0
     W                    5.5                                  1      5.5      7.1
   WNW                    5.5                                  1      5.5      7.9
    NW                   11.1   11.1                           4     22.2      9.9
   NNW                    5.5                                  1      5.5      9.1

  CALM                                                         0      0.0

L. TOTALS         16.5   38.6   33.1   11.1                   18              10.2

00 METER LEVEL WINDS AFTERNOON        JUNE,1978

 DIRECTION   ********* WIND SPEEDS METERS/SECOND *****************************
             00.1   03.0   06.0   10.0   16.0   GREATER        ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN        TOTAL   TOTAL  AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0        COUNT  PERCENT  SPEED

     N                                                         0      0.0
   NNE                                                         0      0.0
    NE                                                         0      0.0
   ENE                                                         0      0.0
     E                                                         0      0.0
   ESE                                                         0      0.0
    SE                                                         0      0.0
   SSE                                                         0      0.0
     S      6.2                                                1      6.2      1.5
   SSW                                                         0      0.0
    SW             6.2   12.5    6.2   12.5                    6     37.4     12.7
   WSW             6.2   12.5                                  3     18.7      6.4
     W                           6.2                           1      6.2     10.7
   WNW      6.2    6.2          12.5                           4     24.9      8.0
    NW                                  6.2                    1      6.2     18.3
   NNW                                                         0      0.0

  CALM                                                         0      0.0

L. TOTALS  12.4   18.6   25.0   24.9   18.7                   16               9.8
```

```
               FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
2500 METER LEVEL WINDS MORNING         JUNE,1978
  DIRECTION   ********* WIND SPEEDS METERS/SECOND ************************
              00.1   03.0   06.0   10.0   16.0  GREATER       ROW   SUMMARY
               TO     TO     TO     TO     TO    THAN       TOTAL   TOTAL  AVERAGE
              02.9   05.9   09.9   15.9   25.0   25.0       COUNT  PERCENT  SPEED

       N                                                      0      0.0
     NNE                                                      0      0.0
      NE                                                      0      0.0
     ENE                                                      0      0.0
       E                                                      0      0.0
     ESE                                                      0      0.0
      SE                                                      0      0.0
     SSE                                                      0      0.0
       S                                                      0      0.0
     SSW                                                      0      0.0
      SW                                                      0      0.0
     WSW                              100.0                   1    100.0    20.0
       W                                                      0      0.0
     WNW                                                      0      0.0
      NW                                                      0      0.0
     NNW                                                      0      0.0

    CALM                                                      0      0.0

COL. TOTALS                           100.0                   1             20.0
2500 METER LEVEL WINDS AFTERNOON       JUNE,1978
  DIRECTION   ********* WIND SPEEDS METERS/SECOND ************************
              00.1   03.0   06.0   10.0   16.0  GREATER       ROW   SUMMARY
               TO     TO     TO     TO     TO    THAN       TOTAL   TOTAL  AVERAGE
              02.9   05.9   09.9   15.9   25.0   25.0       COUNT  PERCENT  SPEED

       N                                                      0      0.0
     NNE                                                      0      0.0
      NE                                                      0      0.0
     ENE                                                      0      0.0
       E                                                      0      0.0
     ESE                                                      0      0.0
      SE                                                      0      0.0
     SSE                                                      0      0.0
       S                                                      0      0.0
     SSW                                                      0      0.0
      SW                                                      0      0.0
     WSW                       50.0                           1     50.0    10.9
       W                                                      0      0.0
     WNW                                                      0      0.0
      NW         50.0                                         1     50.0     5.0
     NNW                                                      0      0.0

    CALM                                                      0      0.0

COL. TOTALS      50.0          50.0                           2              7.9
```

```
                    FREQUENCY SUMMARY OF MIXING HEIGHTS

   LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

  MIXING HEIGHTS -FREQUENCY OF OCCURENCE FOR       JUNE  1978

MIXING HEIGHT         MORNING            AFTERNOON
 (METERS)           OCCURENCES          OCCURENCES

     0- 100              0                   0

   101- 250              0                   0

   251- 500              0                   0

   501- 750              0                   0

   751-1000              0                   0

  1001-1500              0                   0

      >1500              0                   0

      TOTAL              0                   0

 AVERAGE WIND SPEED
 THROUGH MIXED
 LAYER (M/SEC)         0.0                 0.0

 AVERAGE LAPSE RATE
 BELOW FIRST INVER.
    (DEG C /100M)  -00.00              -00.00
```

```
                FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
        SURFACE WINDS MORNING          JULY,1978

  DIRECTION   ********* WIND SPEEDS METERS/SECOND ************************
               00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                TO     TO     TO     TO     TO     THAN       TOTAL   TOTAL   AVERAGE
               02.9   05.9   09.9   15.9   25.0    25.0       COUNT  PERCENT   SPEED

         N                                                       0      0.0
       NNE      5.5                                              1      5.5       .4
        NE      5.5                                              1      5.5       .9
       ENE                                                       0      0.0
         E                                                       0      0.0
       ESE                                                       0      0.0
        SE                                                       0      0.0
       SSE                                                       0      0.0
         S      5.5                                              1      5.5       .9
       SSW                                                       0      0.0
        SW                                                       0      0.0
       WSW     11.1   11.1                                       4     22.2      2.6
         W     27.7   27.7                                      10     55.4      2.6
       WNW      5.5                                              1      5.5      2.7
        NW                                                       0      0.0
       NNW                                                       0      0.0

      CALM                                                       0      0.0

 COL. TOTALS   60.8   38.8                                      18               2.3

        SURFACE WINDS AFTERNOON        JULY,1978

  DIRECTION   ********* WIND SPEEDS METERS/SECOND ************************
               00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                TO     TO     TO     TO     TO     THAN       TOTAL   TOTAL   AVERAGE
               02.9   05.9   09.9   15.9   25.0    25.0       COUNT  PERCENT   SPEED

         N     16.6                                              2     16.6      1.5
       NNE             8.3                                       1      8.3      4.5
        NE      8.3                                              1      8.3      2.7
       ENE      8.3                                              1      8.3      1.8
         E                                                       0      0.0
       ESE                                                       0      0.0
        SE                                                       0      0.0
       SSE      8.3                                              1      8.3      2.2
         S                                                       0      0.0
       SSW                                                       0      0.0
        SW                    8.3    8.3                         2     16.6      8.5
       WSW                                                       0      0.0
         W                                                       0      0.0
       WNW             8.3    8.3                                2     16.6      7.1
        NW                    8.3                                1      8.3      6.3
       NNW      8.3                                              1      8.3       .9

      CALM                                                       0      0.0

 COL. TOTALS   49.8   16.6   24.9    8.3                        12               4.4
```

```
              FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
10) METER LEVEL WINDS MORNING          JULY,1978
 DIRECTION   ********* WIND SPEEDS METERS/SECOND *****************************
             00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
              TO     TO     TO     TC     TO     THAN       TOTAL    TOTAL  AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0       COUNT  PERCENT   SPEED

     N        5.5                                               1      5.5      1.5
   NNE               5.5                                        1      5.5      3.2
    NE        5.5                                               1      5.5      1.1
   ENE                                                          0      0.0
     E        5.5                                               1      5.5       .6
   ESE                                                          0      0.0
    SE        5.5                                               1      5.5      1.9
   SSE                                                          0      0.0
     S                                                          0      0.0
   SSW        5.5                                               1      5.5      1.7
    SW        5.5   22.2                                        5     27.7      3.6
   WSW               5.5                                        1      5.5      3.4
     W        5.5    5.5                                        2     11.0      2.9
   WNW        5.5                                               1      5.5       .7
    NW       11.1                                               2     11.1      1.5
   NNW        5.5                                               1      5.5      1.2

  CALM                                                          0      0.0

OL. TOTALS   60.6   38.7                                       18               2.3
10) METER LEVEL WINDS AFTERNOON        JULY,1978
 DIRECTION   ********* WIND SPEEDS METERS/SECOND *****************************
             00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
              TO     TO     TO     TO     TC     THAN       TOTAL    TOTAL  AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0       COUNT  PERCENT   SPEED

     N        8.3                                               1      8.3      2.5
   NNE                      8.3                                 1      8.3      6.3
    NE        8.3                                               1      8.3      2.6
   ENE       16.6                                               2     16.6      2.3
     E                                                          0      0.0
   ESE                                                          0      0.0
    SE        8.3                                               1      8.3      2.3
   SSE                                                          0      0.0
     S                                                          0      0.0
   SSW                             8.3                          1      8.3     10.5
    SW                      8.3                                 1      8.3      6.2
   WSW                                                          0      0.0
     W                                                          0      0.0
   WNW                            16.6                          2     16.6     12.3
    NW        8.3                                               1      8.3      2.9
   NNW        8.3                                               1      8.3      1.0

  CALM                                                          0      0.0

OL. TOTALS   58.1          16.6   24.9                         12               5.2
```

```
              FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
LOCATION: DEER LODGE CC - HIWAY JUNCTION - MET (MAPS)
300 METER LEVEL WINDS MORNING          JULY,1978

 DIRECTION  ********* WIND SPEEDS METERS/SECOND ***************************
              00.1   03.0   06.0   10.0   16.0  GREATER       ROW   SUMMARY
               TO     TO     TO     TO     TO    THAN       TOTAL    TOTAL   AVERAGE
              02.9   05.9   09.9   15.9   25.0   25.0       COUNT   PERCENT   SPEED

      N        5.5                                             1       5.5      .5
    NNE       16.6    5.5                                      4      22.1     2.3
     NE        5.5                                             1       5.5     1.4
    ENE                                                        0       0.0
      E        5.5                                             1       5.5     1.2
    ESE        5.5                                             1       5.5      .7
     SE                                                        0       0.0
    SSE                                                        0       0.0
      S       16.6                                             3      16.6     1.4
    SSW       11.1   11.1                                      4      22.2     2.7
     SW        5.5                                             1       5.5      .8
    WSW                                                        0       0.0
      W                                                        0       0.0
    WNW               5.5                                      1       5.5     3.8
     NW                                                        0       0.0
    NNW        5.5                                             1       5.5     1.1

   CALM                                                        0       0.0

COL. TOTALS   77.3   22.1                                     18               1.8

300 METER LEVEL WINDS AFTERNOON        JULY,1978

 DIRECTION  ********* WIND SPEEDS METERS/SECOND ***************************
              00.1   03.0   06.0   10.0   16.0  GREATER       ROW   SUMMARY
               TO     TO     TO     TO     TO    THAN       TOTAL    TOTAL   AVERAGE
              02.9   05.9   09.9   15.9   25.0   25.0       COUNT   PERCENT   SPEED

      N        8.3                                             1       8.3     1.4
    NNE        8.3          16.6                               3      24.9     4.6
     NE               8.3                                      1       8.3     4.3
    ENE        8.3                                             1       8.3     1.7
      E                                                        0       0.0
    ESE               8.3                                      1       8.3     3.7
     SE                                                        0       0.0
    SSE                                                        0       0.0
      S                                                        0       0.0
    SSW                                                        0       0.0
     SW                             8.3                        1       8.3    11.9
    WSW        8.3                                             1       8.3     1.7
      W                                                        0       0.0
    WNW                      8.3    8.3           8.3          3      24.9    18.7
     NW                                                        0       0.0
    NNW                                                        0       0.0

   CALM                                                        0       0.0

COL. TOTALS   33.2   16.6   24.9   16.6           8.3         12               7.8
```

```
          FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

00 METER LEVEL WINDS MORNING        JULY,1978

DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

    N         5.5                                            1      5.5       .8
  NNE                       5.5                              1      5.5      8.5
   NE        11.1                                            2     11.1      2.6
  ENE        11.1                                            2     11.1      1.1
    E                                                        0      0.0
  ESE                                                        0      0.0
   SE         5.5    5.5                                     2     11.0      3.0
  SSE         5.5                                            1      5.5      1.0
    S                                                        0      0.0
  SSW        11.1                                            2     11.1      2.1
   SW        11.1    5.5                                     3     16.6      2.5
  WSW        11.1                                            2     11.1      1.1
    W                                                        0      0.0
  WNW                       5.5                              1      5.5      6.7
   NW         5.5                                            1      5.5      1.2
  NNW                                                        0      0.0

 CALM                                                        0      0.0

L. TOTALS    77.5   11.0   11.0                             18               2.5

00 METER LEVEL WINDS AFTERNOON      JULY,1978

DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

    N        16.6                                            2     16.6      1.2
  NNE               16.6    8.3                              3     24.9      5.5
   NE         8.3                                            1      8.3      2.3
  ENE         8.3                                            1      8.3      1.6
    E                                                        0      0.0
  ESE                8.3                                     1      8.3      3.7
   SE                                                        0      0.0
  SSE                                                        0      0.0
    S                                                        0      0.0
  SSW                                                        0      0.0
   SW                8.3                  8.3                2     16.6     14.1
  WSW                                                        0      0.0
    W                                                        0      0.0
  WNW                       8.3           8.3                2     16.6     14.4
   NW                                                        0      0.0
  NNW                                                        0      0.0

 CALM                                                        0      0.0

L. TOTALS    33.2   33.2   16.6           16.6              12               5.9
```

FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

[illegible] METER LEVEL WINDS MORNING JULY,1978

| DIRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| N | 16.6 | | | | | | 3 | 16.6 | 2.2 |
| NNE | 5.5 | 5.5 | | | | | 2 | 11.0 | 3.1 |
| NE | | | | | | | 0 | 0.0 | |
| ENE | 5.5 | | | | | | 1 | 5.5 | 1.6 |
| E | 5.5 | | | | | | 1 | 5.5 | 2.6 |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | 5.5 | | | | | 1 | 5.5 | 5.8 |
| SSE | | | | | | | 0 | 0.0 | |
| S | 5.5 | 5.5 | | | | | 2 | 11.0 | 2.4 |
| SSW | 5.5 | | | | | | 1 | 5.5 | 1.4 |
| SW | 11.1 | 5.5 | | | | | 3 | 16.6 | 2.2 |
| WSW | | | | | | | 0 | 0.0 | |
| W | | 11.1 | | | | | 2 | 11.1 | 4.1 |
| WNW | 5.5 | | 5.5 | | | | 2 | 11.0 | 4.2 |
| NW | | | | | | | 0 | 0.0 | |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 60.7 | 33.1 | 5.5 | | | | 18 | | 2.9 |

[illegible] METER LEVEL WINDS AFTERNOON JULY,1978

| DIRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| N | | | | | | | 0 | 0.0 | |
| NNE | 8.3 | 8.3 | | | | | 2 | 16.6 | 2.9 |
| NE | | | 8.3 | | | | 1 | 8.3 | 6.0 |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | 8.3 | | | | 1 | 8.3 | 6.8 |
| ESE | | 8.3 | | | | | 1 | 8.3 | 4.2 |
| SE | 8.3 | | | | | | 1 | 8.3 | 2.9 |
| SSE | | | | | | | 0 | 0.0 | |
| S | | | | | | | 0 | 0.0 | |
| SSW | | | | | | | 0 | 0.0 | |
| SW | 8.3 | | | | | 8.3 | 2 | 16.6 | 21.5 |
| WSW | | | | | | | 0 | 0.0 | |
| W | | | | | | | 0 | 0.0 | |
| WNW | 8.3 | 8.3 | | | 16.6 | | 4 | 33.2 | 10.8 |
| NW | | | | | | | 0 | 0.0 | |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 33.2 | 24.9 | 16.6 | | 16.6 | 8.3 | 12 | | 9.3 |

## FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

CCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

60 METER LEVEL WINDS MORNING          JULY,1978

| DIRECTION | ********** WIND SPEEDS METERS/SECOND | | | | | **************************** | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
| N | | | | | | | 0 | 0.0 | |
| NNE | | | 5.8 | | | | 1 | 5.8 | 6.6 |
| NE | 5.8 | | | | | | 1 | 5.8 | 2.1 |
| ENE | 5.8 | 5.8 | | | | | 2 | 11.6 | 2.3 |
| E | | | | | | | 0 | 0.0 | |
| ESE | 5.8 | | | | | | 1 | 5.8 | .6 |
| SE | 5.8 | | | | | | 1 | 5.8 | .9 |
| SSE | | | 5.8 | | | | 1 | 5.8 | 7.1 |
| S | | 5.8 | | | | | 1 | 5.8 | 5.4 |
| SSW | 5.8 | | | | | | 1 | 5.8 | 2.4 |
| SW | | | | | | | 0 | 0.0 | |
| WSW | | 5.8 | | | | | 1 | 5.8 | 3.8 |
| W | 17.6 | 5.8 | 5.8 | | | | 5 | 29.2 | 3.6 |
| WNW | | 5.8 | | | | | 1 | 5.8 | 3.9 |
| NW | | | | | | | 0 | 0.0 | |
| NNW | 5.8 | | | | | | 1 | 5.8 | .8 |
| CALM | | | | | | | 0 | 0.0 | |
| L. TOTALS | 52.4 | 29.0 | 17.4 | | | | 17 | | 3.3 |

60 METER LEVEL WINDS AFTERNOON          JULY,1978

| DIRECTION | ********** WIND SPEEDS METERS/SECOND | | | | | **************************** | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
| N | | | | | | | 0 | 0.0 | |
| NNE | 8.3 | | | | | | 1 | 8.3 | 1.5 |
| NE | | | | 8.3 | | 8.3 | 2 | 16.6 | 23.6 |
| ENE | | | | | | | 0 | 0.0 | |
| E | | 8.3 | | | 8.3 | | 2 | 16.6 | 11.3 |
| ESE | 8.3 | | | | | | 1 | 8.3 | 1.6 |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | | | | | | 0 | 0.0 | |
| SSW | 8.3 | | | | | | 1 | 8.3 | 2.8 |
| SW | | | | | | | 0 | 0.0 | |
| WSW | | | | | | | 0 | 0.0 | |
| W | | | | | | | 0 | 0.0 | |
| WNW | | | | | 8.3 | 8.3 | 2 | 16.6 | 26.0 |
| NW | 8.3 | 8.3 | 8.3 | | | | 3 | 24.9 | 3.9 |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| L. TOTALS | 33.2 | 16.6 | 8.3 | 8.3 | 16.6 | 16.6 | 12 | | 11.6 |

```
                 FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
1000 METER LEVEL WINDS MORNING          JULY,1978
  DIRECTION   ******** WIND SPEEDS METERS/SECOND *****************************
              00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
               TO     TO     TO     TO     TO     THAN       TOTAL   TOTAL   AVERAGE
              02.9   05.9   09.9   15.9   25.0    25.0       COUNT  PERCENT   SPEED

       N                                                        0     0.0
     NNE                                                        0     0.0
      NE             6.2                                        1     6.2       4.5
     ENE                                                        0     0.0
       E      6.2    6.2                                        2    12.4       3.8
     ESE                                                        0     0.0
      SE                                                        0     0.0
     SSE             6.2                                        1     6.2       4.2
       S                    6.2                                 1     6.2       6.
     SSW            12.5                                        2    12.5       4.1
      SW             6.2                                        1     6.2       5.5
     WSW             6.2                                        1     6.2       3.9
       W            12.5    6.2                                 3    18.7       5.0
     WNW      6.2   12.5           6.2                          4    24.9       4.9
      NW                                                        0     0.0
     NNW                                                        0     0.0

    CALM                                                        0     0.0

COL. TOTALS  12.4   68.5   12.4    6.2                         16               4.6
1000 METER LEVEL WINDS AFTERNOON        JULY,1978
  DIRECTION   ******** WIND SPEEDS METERS/SECOND *****************************
              00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
               TO     TO     TO     TO     TO     THAN       TOTAL   TOTAL   AVERAGE
              02.9   05.9   09.9   15.9   25.0    25.0       COUNT  PERCENT   SPEED

       N                                                        0     0.0
     NNE                                                        0     0.0
      NE                                  9.0                   1     9.0      24.5
     ENE                                                        0     0.0
       E             9.0                  9.0                   2    18.0      13.4
     ESE                                                        0     0.0
      SE                                                        0     0.0
     SSE                                                        0     0.0
       S                                                        0     0.0
     SSW      9.0                                               1     9.0       2.0
      SW             9.0                                        1     9.0       4.1
     WSW             9.0                                        1     9.0       3.9
       W      9.0    9.0    9.0                                 3    27.0       5.3
     WNW      9.0                         9.0                   2    18.0      11.9
      NW                                                        0     0.0
     NNW                                                        0     0.0

    CALM                                                        0     0.0

COL. TOTALS  27.0   36.0    9.0           27.0                 11               9.2
```

```
                 FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
500 METER LEVEL WINDS MORNING         JULY,1978
 DIRECTION   ********* WIND SPEEDS METERS/SECOND ****************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

       N                                                     0      0.0
     NNE                                                     0      0.0
      NE                                                     0      0.0
     ENE                                                     0      0.0
       E                  6.6                                1      6.6       6.1
     ESE           6.6    6.6                                2     13.2       7.1
      SE                                                     0      0.0
     SSE                                                     0      0.0
       S                                                     0      0.0
     SSW                         13.3                        2     13.3      12.5
      SW                                                     0      0.0
     WSW    6.6    6.6                                       2     13.2       3.8
       W          13.3    6.6    6.6                         4     26.5       7.9
     WNW                  6.6    6.6                         2     13.2       9.3
      NW           6.6    6.6                                2     13.2       6.5
     NNW                                                     0      0.0

   CALM                                                      0      0.0

OL. TOTALS    6.6   33.1   33.0   26.5                      15                7.7
500 METER LEVEL WINDS AFTERNOON       JULY,1978
 DIRECTION   ********* WIND SPEEDS METERS/SECOND ****************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

       N                                                     0      0.0
     NNE                                                     0      0.0
      NE                         11.1                        1     11.1      13.6
     ENE                                                     0      0.0
       E                                                     0      0.0
     ESE   11.1          11.1                                2     22.2       5.8
      SE                                                     0      0.0
     SSE                                                     0      0.0
       S   11.1                                              1     11.1       1.1
     SSW                                                     0      0.0
      SW                 11.1   11.1                         2     22.2       8.7
     WSW                 11.1                                1     11.1       7.5
       W          11.1          11.1                         2     22.2       9.4
     WNW                                                     0      0.0
      NW                                                     0      0.0
     NNW                                                     0      0.0

   CALM                                                      0      0.0

OL. TOTALS   22.2   11.1   33.3   33.3                       9                7.7
```

```
              FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MARS)
2000 METER LEVEL WINDS MORNING          JULY,1978
  DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
               00.1   03.0   06.0   10.0   16.0  GREATER       ROW   SUMMARY
                TO     TO     TO     TO     TO    THAN       TOTAL    TOTAL   AVERAGE
               02.9   05.9   09.9   15.9   25.0   25.0       COUNT   PERCENT   SPEED

          N                                                    0       0.0
        NNE                                                    0       0.0
         NE                                                    0       0.0
        ENE                                                    0       0.0
          E                   8.3                              1       8.3       7.2
        ESE           8.3                                      1       8.3       4.0
         SE                                                    0       0.0
        SSE                                                    0       0.0
          S                                                    0       0.0
        SSW                          8.3                       1       8.3      15.5
         SW                          8.3                       1       8.3      13.6
        WSW    8.3                   8.3                       2      16.6       6.1
          W                         16.6                       2      16.6      12.4
        WNW                         25.0                       3      25.0      11.6
         NW           8.3                                      1       8.3       5.9
        NNW                                                    0       0.0

      CALM                                                     0       0.0

 COL. TOTALS   8.3   16.6    8.3   66.5                       12                 9.8
2000 METER LEVEL WINDS AFTERNOON        JULY,1978
  DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
               00.1   03.0   06.0   10.0   16.0  GREATER       ROW   SUMMARY
                TO     TO     TO     TO     TO    THAN       TOTAL    TOTAL   AVERAGE
               02.9   05.9   09.9   15.9   25.0   25.0       COUNT   PERCENT   SPEED

          N                                                    0       0.0
        NNE                                                    0       0.0
         NE                                                    0       0.0
        ENE                         12.5                       1      12.5      12.5
          E                                      12.5          1      12.5      37.7
        ESE                                                    0       0.0
         SE                                                    0       0.0
        SSE   12.5                                             1      12.5       1.4
          S                                                    0       0.0
        SSW                         12.5                       1      12.5      10.0
         SW                  12.5   12.5                       2      25.0       9.2
        WSW                                                    0       0.0
          W                  12.5                              1      12.5       7.8
        WNW                  12.5                              1      12.5       6.5
         NW                                                    0       0.0
        NNW                                                    0       0.0

      CALM                                                     0       0.0

 COL. TOTALS  12.5           37.5   37.5         12.5          8                11.8
```

```
                    FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

2500 METER LEVEL WINDS MORNING          JULY,1978

  DIRECTION  ********* WIND SPEEDS METERS/SECOND ******************************
             00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN       TOTAL    TOTAL   AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0       COUNT   PERCENT   SPEED

      N                                                       0       0.0
    NNE                                                       0       0.0
     NE                                                       0       0.0
    ENE                                                       0       0.0
      E                                                       0       0.0
    ESE                                                       0       0.0
     SE                                                       0       0.0
    SSE                                                       0       0.0
      S                                                       0       0.0
    SSW                                                       0       0.0
     SW                                                       0       0.0
    WSW                                                       0       0.0
      W                                                       0       0.0
    WNW                                                       0       0.0
     NW                                                       0       0.0
    NNW                                                       0       0.0

   CALM                                                       0       0.0

COL. TOTALS                                                   0

2500 METER LEVEL WINDS AFTERNOON        JULY,1978

  DIRECTION  ********* WIND SPEEDS METERS/SECOND ******************************
             00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN       TOTAL    TOTAL   AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0       COUNT   PERCENT   SPEED

      N                                                       0       0.0
    NNE                                                       0       0.0
     NE                                                       0       0.0
    ENE                                                       0       0.0
      E                                                       0       0.0
    ESE                                                       0       0.0
     SE                                                       0       0.0
    SSE                                                       0       0.0
      S                                                       0       0.0
    SSW                                                       0       0.0
     SW                    50.0                               1      50.0      9.9
    WSW                                                       0       0.0
      W                                                       0       0.0
    WNW                                                       0       0.0
     NW                                                       0       0.0
    NNW      50.0                                             1      50.0      1.7

   CALM                                                       0       0.0

COL. TOTALS  50.0          50.0                               2                5.9
```

```
                   FREQUENCY SUMMARY OF MIXING HEIGHTS

     LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

    MIXING HEIGHTS -FREQUENCY OF OCCURENCE FOR       JULY  1978

 MIXING HEIGHT          MORNING              AFTERNOON
   (METERS)           OCCURENCES            OCCURENCES

      0- 100               0                     0

    101- 250               0                     0

    251- 500               0                     0

    501- 750               0                     0

    751-1000               0                     0

   1001-1500               0                     0

       >1500               0                     0

       TOTAL               0                     0

  AVERAGE WIND SPEED
  THROUGH MIXED
  LAYER (M/SEC)          0.0                   0.0

  AVERAGE LAPSE RATE
  BELOW FIRST INVER.
     (DEG C /100M)   -00.00                -00.00
```

```
                  FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
          SURFACE WINDS MORNING       AUGUST,1978
 DIRECTION   ******** WIND SPEEDS METERS/SECOND *****************************
              00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
               TO     TO     TO     TC     TO     THAN      TOTAL   TOTAL   AVERAGE
              02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

      N                                                        0      0.0
    NNE                                                        0      0.0
     NE                                                        0      0.0
    ENE        5.0                                             1      5.0        .9
      E                                                        0      0.0
    ESE                                                        0      0.0
     SE                                                        0      0.0
    SSE                                                        0      0.0
      S                                                        0      0.0
    SSW        5.0                                             1      5.0       2.7
     SW       15.0                                             3     15.0        .4
    WSW       20.0   15.0                                      7     35.0       2.9
      W       35.0                                             7     35.0       2.0
    WNW                                                        0      0.0
     NW                                                        0      0.0
    NNW        5.0                                             1      5.0        .9

  CALM                                                         0      0.0

OL. TOTALS    85.0   15.0                                     20                2.0
          SURFACE WINDS AFTERNOON     AUGUST,1978
 DIRECTION   ******** WIND SPEEDS METERS/SECOND *****************************
              00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
               TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
              02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

      N                                                        0      0.0
    NNE       23.5    5.8                                      5     29.3       2.6
     NE       17.6                                             3     17.6       2.6
    ENE        5.8                                             1      5.8       2.7
      E                                                        0      0.0
    ESE                                                        0      0.0
     SE                                                        0      0.0
    SSE        5.8                                             1      5.8        .4
      S                                                        0      0.0
    SSW        5.8           5.8                               2     11.6       3.8
     SW                      5.8                               1      5.8       6.7
    WSW                                                        0      0.0
      W       11.7                                             2     11.7       2.2
    WNW               5.8                                      1      5.8       4.5
     NW                                                        0      0.0
    NNW               5.8                                      1      5.8       4.5

  CALM                                                         0      0.0

OL. TOTALS    70.2   17.4   11.6                              17                3.0
```

```
                FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

  LOCATION: DEER LODGE CC - HIWAY JUNCTION - MET (MAPS)

  100 METER LEVEL WINDS MORNING        AUGUST,1978

   DIRECTION   ********* WIND SPEEDS METERS/SECOND ****************************
               00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
               02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

        N                                                      0      0.0
      NNE             5.0                                      1      5.0      3.3
       NE                                                      0      0.0
      ENE                                                      0      0.0
        E                                                      0      0.0
      ESE                                                      0      0.0
       SE                                                      0      0.0
      SSE                                                      0      0.0
        S                                                      0      0.0
      SSW             5.0                                      1      5.0      5.1
       SW     10.0   10.0                                      4     20.0      3.2
      WSW     15.0    5.0    5.0                               5     25.0      4.2
        W     20.0   10.0                                      6     30.0      2.7
      WNW                                                      0      0.0
       NW      5.0                                             1      5.0      2.8
      NNW     10.0                                             2     10.0      1.3

     CALM                                                      0      0.0

  COL. TOTALS  60.0   35.0    5.0                             20               3.2

  100 METER LEVEL WINDS AFTERNOON      AUGUST,1978

   DIRECTION   ********* WIND SPEEDS METERS/SECOND ****************************
               00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
               02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

        N                    5.8                               1      5.8      7.3
      NNE            17.6                                      3     17.6      4.1
       NE     17.6    5.8                                      4     23.4      2.9
      ENE             5.8                                      1      5.8      4.4
        E                                                      0      0.0
      ESE      5.8                                             1      5.8      1.1
       SE                                                      0      0.0
      SSE                                                      0      0.0
        S                                                      0      0.0
      SSW             5.8    5.8                               2     11.6      5.3
       SW             5.8                                      1      5.8      4.5
      WSW                                                      0      0.0
        W            11.7                                      2     11.7      3.7
      WNW                    5.8    5.8                        2     11.6     11.7
       NW                                                      0      0.0
      NNW                                                      0      0.0

     CALM                                                      0      0.0

  COL. TOTALS  23.4   52.5   17.4    5.8                      17               4.8
```

```
                  FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
00 METER LEVEL WINDS MORNING       AUGUST,1978
 DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
               00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
               02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

     N                                                           0      0.0
   NNE                 5.0                                       1      5.0        5.1
    NE          5.0                                              1      5.0         .6
   ENE                                                           0      0.0
     E                                                           0      0.0
   ESE                                                           0      0.0
    SE                                                           0      0.0
   SSE                                                           0      0.0
     S                                                           0      0.0
   SSW          5.0   20.0                                       5     25.0        4.2
    SW         15.0    5.0                                       4     20.0        2.3
   WSW          5.0                                              1      5.0        2.4
     W         10.0    5.0                                       3     15.0        2.9
   WNW                        5.0                                1      5.0        7.9
    NW          5.0                                              1      5.0        1.3
   NNW         15.0                                              3     15.0        1.6

  CALM                                                           0      0.0

CL. TOTALS     60.0   35.0    5.0                               20                 3.0
00 METER LEVEL WINDS AFTERNOON     AUGUST,1978
 DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
               00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
               02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

     N                                                           0      0.0
   NNE          5.8   23.5    5.8                                6     35.1        4.6
    NE                11.7                                       2     11.7        4.0
   ENE                 5.8                                       1      5.8        3.5
     E                                                           0      0.0
   ESE                                                           0      0.0
    SE                                                           0      0.0
   SSE                                                           0      0.0
     S                                                           0      0.0
   SSW                 5.8                                       1      5.8        3.2
    SW                 5.8                                       1      5.8        5.5
   WSW          5.8                                              1      5.8        2.9
     W          5.8   11.7    5.8                                4     23.3        4.8
   WNW                                                           0      0.0
    NW                                                           0      0.0
   NNW          5.8                                              1      5.8        2.7

  CALM                                                           0      0.0

CL. TOTAL      23.2   64.3   11.6                               17                 4.2
```

## FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

300 METER LEVEL WINDS MORNING AUGUST,1978

| DIRECTION | ********* WIND SPEEDS METERS/SECOND ******** 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| N | | 5.0 | | | | | 1 | 5.0 | 3.7 |
| NNE | 5.0 | 5.0 | | | | | 2 | 10.0 | 3.0 |
| NE | | | | | | | 0 | 0.0 | |
| ENE | | | | | | | 0 | 0.0 | |
| E | 5.0 | | | | | | 1 | 5.0 | 1.4 |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | 10.0 | | | | | | 2 | 10.0 | 1.2 |
| SSW | 10.0 | 10.0 | 5.0 | | | | 5 | 25.0 | 3.8 |
| SW | 15.0 | | | | | | 3 | 15.0 | 2.3 |
| WSW | | 5.0 | | | | | 1 | 5.0 | 5.8 |
| W | | | | | | | 0 | 0.0 | |
| WNW | | 5.0 | 5.0 | | | | 2 | 10.0 | 5.5 |
| NW | 5.0 | | | | | | 1 | 5.0 | 1.0 |
| NNW | 10.0 | | | | | | 2 | 10.0 | 1.0 |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 60.0 | 30.0 | 10.0 | | | | 20 | | 2.9 |

300 METER LEVEL WINDS AFTERNOON AUGUST,1978

| DIRECTION | ********* WIND SPEEDS METERS/SECOND ******** 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| N | | 11.7 | | | | | 2 | 11.7 | 3.5 |
| NNE | 5.8 | 5.8 | 17.6 | | | | 5 | 29.2 | 5.7 |
| NE | 5.8 | 11.7 | | | | | 3 | 17.5 | 3.6 |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | | | | | | 0 | 0.0 | |
| SSW | | 5.8 | | | | | 1 | 5.8 | 3.2 |
| SW | | 5.8 | | 5.8 | | | 2 | 11.6 | 7.4 |
| WSW | 5.8 | | | | | | 1 | 5.8 | 2.8 |
| W | 5.8 | 5.8 | | | | | 2 | 11.6 | 3.1 |
| WNW | | | | | 5.8 | | 1 | 5.8 | 16.8 |
| NW | | | | | | | 0 | 0.0 | |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 23.2 | 46.6 | 17.6 | 5.8 | 5.8 | | 17 | | 5.3 |

```
                FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

LOCATION: DEER LODGE CC - HIWAY JUNCTION - MET (MAPS)

00 METER LEVEL WINDS MORNING        AUGUST,1978

DIRECTION   ********** WIND SPEEDS METERS/SECOND ******************************
             00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN       TOTAL    TOTAL   AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0       COUNT   PERCENT   SPEED

      N      10.0    5.0                                        3     15.0      2.6
    NNE                                                         0      0.0
     NE                                                         0      0.0
    ENE                                                         0      0.0
      E                                                         0      0.0
    ESE                                                         0      0.0
     SE       5.0                                               1      5.0      1.2
    SSE                                                         0      0.0
      S                                                         0      0.0
    SSW             10.0    5.0                                 3     15.0      5.7
     SW      10.0                                               2     10.0      2.6
    WSW      10.0   10.0                                        4     20.0      3.3
      W       5.0          10.0                                 3     15.0      5.6
    WNW       5.0           5.0                                 2     10.0      5.1
     NW       5.0                                               1      5.0      2.0
    NNW       5.0                                               1      5.0       .3

   CALM                                                         0      0.0

OL. TOTALS   55.0   25.0   20.0                                20               3.7

00 METER LEVEL WINDS AFTERNOON      AUGUST,1978

DIRECTION   ********** WIND SPEEDS METERS/SECOND ******************************
             00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN       TOTAL    TOTAL   AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0       COUNT   PERCENT   SPEED

      N             11.7                                        2     11.7      4.3
    NNE              5.8   11.7                                 3     17.5      6.1
     NE              5.8                                        1      5.8      3.3
    ENE      11.7                                               2     11.7      1.1
      E       5.8                                               1      5.8       .1
    ESE                                                         0      0.0
     SE                                                         0      0.0
    SSE                                                         0      0.0
      S                                                         0      0.0
    SSW              5.8                                        1      5.8      4.0
     SW       5.8                  5.8                          2     11.6      8.0
    WSW                            5.8                          1      5.8     12.8
      W                                                         0      0.0
    WNW                     5.8    5.8                          2     11.6     11.0
     NW                                                         0      0.0
    NNW      11.7                                               2     11.7      1.5

   CALM                                                         0      0.0

OL. TOTALS   35.0   29.1   17.5   17.4                         17               5.3
```

```
                FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

750 METER LEVEL WINDS MORNING      AUGUST,1978

 DIRECTION  ********* WIND SPEEDS METERS/SECOND *************************
              00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                TO     TO     TO     TO     TO      THAN    TOTAL     TOTAL  AVERAGE
              02.9   05.9   09.9   15.9   25.0      25.0    COUNT   PERCENT    SPEED

           N                                                     0       0.0
         NNE    5.2           5.2                                2      10.4      4.8
          NE                                                     0       0.0
         ENE                                                     0       0.0
           E                                                     0       0.0
         ESE                                                     0       0.0
          SE                                                     0       0.0
         SSE           5.2                                       1       5.2      5.4
           S                                                     0       0.0
         SSW   10.5    5.2    5.2                                4      20.9      4.0
          SW   10.5    5.2                                       3      15.7      2.7
         WSW                                                     0       0.0
           W                 10.5    5.2                         3      15.7      8.9
         WNW    5.2   10.5    5.2    5.2                         5      26.1      5.8
          NW                                                     0       0.0
         NNW    5.2                                              1       5.2      2.8

        CALM                                                     0       0.0

COL. TOTALS    36.6   26.1   26.1   10.4                        19                5.1

750 METER LEVEL WINDS AFTERNOON    AUGUST,1978

 DIRECTION  ********* WIND SPEEDS METERS/SECOND *************************
              00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                TO     TO     TO     TO     TO      THAN    TOTAL     TOTAL  AVERAGE
              02.9   05.9   09.9   15.9   25.0      25.0    COUNT   PERCENT    SPEED

           N           5.8                                       1       5.8      4.8
         NNE    5.8    5.8    5.8                                3      17.4      4.7
          NE                                                     0       0.0
         ENE                                                     0       0.0
           E                  5.8                                1       5.8      8.0
         ESE                                                     0       0.0
          SE                                                     0       0.0
         SSE                                                     0       0.0
           S                                                     0       0.0
         SSW                  5.8                                1       5.8      9.6
          SW    5.8                  5.8                         2      11.6      8.2
         WSW    5.8                         5.8                  2      11.6     12.5
           W   11.7           5.8                                3      17.5      3.9
         WNW                         5.8                         1       5.8     13.3
          NW    5.8    5.8                                       2      11.6      3.2
         NNW    5.8                                              1       5.8      1.9

        CALM                                                     0       0.0

COL. TOTALS    40.7   17.4   23.2   11.6    5.8                 17                6.5
```

```
             FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
000 METER LEVEL WINDS MORNING        AUGUST,1978

 DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
              00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
               TO     TO     TO     TO     TO     THAN      TOTAL    TOTAL  AVERAGE
              02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

      N        5.5                                            1       5.5      1.9
    NNE                                                       0       0.0
     NE                                          5.5          1       5.5     72.4
    ENE               5.5                                     1       5.5      3.7
      E       11.1                                            2      11.1      1.0
    ESE                                                       0       0.0
     SE                                                       0       0.0
    SSE                                                       0       0.0
      S                                                       0       0.0
    SSW               5.5                                     1       5.5      4.2
     SW       11.1   11.1    5.5                              5      27.7      4.3
    WSW       11.1           5.5                              3      16.6      3.6
      W        5.5          11.1                              3      16.6      5.7
    WNW                             5.5                       1       5.5     14.1
     NW                                                       0       0.0
    NNW                                                       0       0.0

   CALM                                                       0       0.0

CL. TOTALS    44.3   22.1   22.1    5.5          5.5         18                8.2
000 METER LEVEL WINDS AFTERNOON      AUGUST,1978

 DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
              00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
               TO     TO     TO     TO     TO     THAN      TOTAL    TOTAL  AVERAGE
              02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

      N        6.2                                            1       6.2       .3
    NNE               6.2                                     1       6.2      5.2
     NE        6.2                                            1       6.2      1.9
    ENE                                                       0       0.0
      E                                                       0       0.0
    ESE        6.2                                            1       6.2       .8
     SE                                                       0       0.0
    SSE                                                       0       0.0
      S        6.2                                            1       6.2      2.8
    SSW                                    6.2                1       6.2     19.3
     SW                             6.2                       1       6.2     14.6
    WSW              12.5    6.2                 6.2          4      24.9     20.8
      W        6.2                                            1       6.2      2.5
    WNW       12.5    6.2    6.2                              4      24.9      4.0
     NW                                                       0       0.0
    NNW                                                       0       0.0

   CALM                                                       0       0.0

CL. TOTALS    43.5   24.9   12.4    6.2    6.2   6.2         16                9.1
```

```
                    FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

1500 METER LEVEL WINDS MORNING       AUGUST,1978

  DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
               00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
               02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

       N                                                       0      0.0
     NNE        5.8                                            1      5.8       2.6
      NE                                                       0      0.0
     ENE                                          5.8          1      5.8      92.5
       E                                                       0      0.0
     ESE                            5.8                        1      5.8      13.2
      SE                                                       0      0.0
     SSE                                                       0      0.0
       S                                                       0      0.0
     SSW               5.8                                     1      5.8       3.6
      SW                            5.8                        1      5.8      14.6
     WSW              17.6   11.7                              5     29.3       5.9
       W        5.8    5.8    5.8                              3     17.4       5.2
     WNW        5.8                11.7                        3     17.5       8.6
      NW               5.8                                     1      5.8       4.5
     NNW                                                       0      0.0

    CALM                                                       0      0.0

COL. TOTALS    17.4   35.0   17.5   23.3              5.8         17             11.9

1500 METER LEVEL WINDS AFTERNOON     AUGUST,1978

  DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
               00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
               02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

       N                                                       0      0.0
     NNE                                                       0      0.0
      NE                                                       0      0.0
     ENE                                                       0      0.0
       E               8.3                                     1      8.3       3.0
     ESE                                                       0      0.0
      SE                                                       0      0.0
     SSE                                                       0      0.0
       S                                                       0      0.0
     SSW                                                       0      0.0
      SW                      8.3    8.3                8.3    3     24.9      18.4
     WSW        8.3           8.3                              2     16.6       4.2
       W               8.3    8.3                              2     16.6       5.5
     WNW        8.3    8.3   16.6                              4     33.2       5.7
      NW                                                       0      0.0
     NNW                                                       0      0.0

    CALM                                                       0      0.0

COL. TOTALS    16.6   24.9   41.5    8.3                8.3       12              8.3
```

FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

00 METER LEVEL WINDS MORNING AUGUST,1978

| DIRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| N | | | | | | | 0 | 0.0 | |
| NNE | 6.6 | | | | | | 1 | 6.6 | 2.8 |
| NE | | | | | | | 0 | 0.0 | |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | 6.6 | | | | 1 | 6.6 | 9.4 |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | | | | | | 0 | 0.0 | |
| SSW | | 6.6 | | | | | 1 | 6.6 | 3.8 |
| SW | | | | 6.6 | | | 1 | 6.6 | 14.0 |
| WSW | | | | 6.6 | 13.3 | | 3 | 19.9 | 16.0 |
| W | | 6.6 | 6.6 | 6.6 | | | 3 | 19.8 | 8.9 |
| WNW | | | 13.3 | 6.6 | | | 3 | 19.9 | 9.5 |
| NW | | | 13.3 | | | | 2 | 13.3 | 7.6 |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| OL. TOTALS | 6.6 | 13.2 | 39.8 | 26.4 | 13.3 | | 15 | | 9.9 |

00 METER LEVEL WINDS AFTERNOON AUGUST,1978

| DIRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| N | | | | | | | 0 | 0.0 | |
| NNE | | | | | | | 0 | 0.0 | |
| NE | | | | | 9.0 | | 1 | 9.0 | 23.0 |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | | 9.0 | | | | 1 | 9.0 | 6.4 |
| SSW | 9.0 | | | | | | 1 | 9.0 | 2.8 |
| SW | | | | 9.0 | 9.0 | | 2 | 18.0 | 17.5 |
| WSW | | 9.0 | | | | | 1 | 9.0 | 3.1 |
| W | | | 9.0 | | | | 1 | 9.0 | 7.2 |
| WNW | | | 18.1 | 9.0 | | | 3 | 27.1 | 9.8 |
| NW | | | | 9.0 | | | 1 | 9.0 | 10.3 |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| OL. TOTALS | 9.0 | 9.0 | 36.1 | 27.0 | 18.0 | | 11 | | 10.6 |

```
          FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
2500 METER LEVEL WINDS MORNING      AUGUST,1978

  DIRECTION  ********* WIND SPEEDS METERS/SECOND *************************
            00.1   03.0   06.0   10.0   16.0   GREATER     ROW   SUMMARY
             TO     TO     TO     TO     TO     THAN     TOTAL   TOTAL  AVERAGE
            02.9   05.9   09.9   15.9   25.0    25.0     COUNT  PERCENT  SPEED

       N                                                   0      0.0
     NNE                                                   0      0.0
      NE                                                   0      0.0
     ENE                                                   0      0.0
       E                                                   0      0.0
     ESE                                                   0      0.0
      SE                                                   0      0.0
     SSE                                                   0      0.0
       S                                                   0      0.0
     SSW                                                   0      0.0
      SW                                                   0      0.0
     WSW                                                   0      0.0
       W                                                   0      0.0
     WNW                                                   0      0.0
      NW                                                   0      0.0
     NNW                                                   0      0.0

    CALM                                                   0      0.0

COL. TOTALS                                                0

2500 METER LEVEL WINDS AFTERNOON    AUGUST,1978

  DIRECTION  ********* WIND SPEEDS METERS/SECOND *************************
            00.1   03.0   06.0   10.0   16.0   GREATER     ROW   SUMMARY
             TO     TO     TO     TO     TO     THAN     TOTAL   TOTAL  AVERAGE
            02.9   05.9   09.9   15.9   25.0    25.0     COUNT  PERCENT  SPEED

       N                                                   0      0.0
     NNE                                                   0      0.0
      NE                                                   0      0.0
     ENE                                                   0      0.0
       E                                                   0      0.0
     ESE                                                   0      0.0
      SE                                                   0      0.0
     SSE                                                   0      0.0
       S                                                   0      0.0
     SSW                                                   0      0.0
      SW                         100.0                     1    100.0    14.5
     WSW                                                   0      0.0
       W                                                   0      0.0
     WNW                                                   0      0.0
      NW                                                   0      0.0
     NNW                                                   0      0.0

    CALM                                                   0      0.0

COL. TOTALS                      100.0                     1             14.5
```

```
                    FREQUENCY SUMMARY OF INVERSIONS (PERCENTAGES)

 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

                      MONTH OF     AUGUST 1978     MORNING

            ***************** INVERSION BASE HEIGHT (METERS) ***************
            SFC    001    101    251    501    751   1001   1501   2001   2501    >
ICKNESS             TO     TO     TO     TO     TO     TO     TO     TO     TO   THAN     TOTAL
METERS)            100    250    500    750   1000   1500   2000   2500   3000   3000

1-100      6.4           9.6    3.2    9.6    3.2    6.4    9.6                           48.0

1-250     12.9           3.2    6.4    6.4    3.2    3.2                                  35.3

1-500      3.2    3.2                                                                      6.4

1-750

TAL       22.5    3.2   12.8    9.6   16.0    6.4    9.6    9.6

 INVERSION                                                                                 9.0

                                                          TOTAL NO. OF OCCURENCES         28

NVERSION
 TYPE

 1                       3.5    7.1    7.1    3.5    7.1    7.1                           35.4

 2         3.5           7.1    3.5    3.5    3.5    3.5    3.5                           28.1

 3        14.2    3.5    3.5           3.5                                                24.7

 4         7.1                                                                             7.1

 5                                     3.5                                                 3.5

                      MONTH OF     AUGUST 1978     AFTERNOON

            ***************** INVERSION BASE HEIGHT (METERS) ***************
            SFC    001    101    251    501    751   1001   1501   2001   2501    >
ICKNESS             TO     TO     TO     TO     TO     TO     TO     TO     TO   THAN     TOTAL
METERS)            100    250    500    750   1000   1500   2000   2500   3000   3000

1-100                           6.2   18.7    6.2   25.0                                  56.1

1-250                                 12.5                                                12.5

1-500                                         6.2                                          6.2

1-750

TAL                             6.2   31.2   12.4   25.0

 INVERSION                                                                                25.0

                                                          TOTAL NO. OF OCCURENCES         12

NVERSION
 TYPE

 1                              6.3   25.0   16.6   25.0                                  74.9

 2                                     8.3           8.3                                  16.6

 3                                     8.3                                                 8.3

 4

 5
```

```
                 FREQUENCY SUMMARY OF MIXING HEIGHTS

     LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

    MIXING HEIGHTS -FREQUENCY OF OCCURENCE FOR    AUGUST  1978

 MIXING HEIGHT          MORNING               AFTERNOON
   (METERS)           OCCURENCES             OCCURENCES

      0- 100               6                      0

    101- 250               1                      0

    251- 500               1                      3

    501- 750               1                      2

    751-1000               0                      1

   1001-1500               1                      0

       >1500               1                      4

       TOTAL              11                     10


  AVERAGE WIND SPEED
  THROUGH MIXED
  LAYER (M/SEC)          4.3                    6.7


  AVERAGE LAPSE RATE
  BELOW FIRST INVER.
     (DEG C /100M)   -00.36                 -01.17
```

```
               FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
        SURFACE WINDS MORNING   SEPTEMBER,1978
 DIRECTION   ********* WIND SPEEDS METERS/SECOND *************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

     N                                                       0      0.0
   NNE       14.2                                            2     14.2       .3
    NE                                                       0      0.0
   ENE                                                       0      0.0
     E        7.1                                            1      7.1       .4
   ESE                                                       0      0.0
    SE                                                       0      0.0
   SSE              7.1                                      1      7.1      3.6
     S              7.1                                      1      7.1      3.1
   SSW        7.1                                            1      7.1      1.8
    SW        7.1   7.1    7.1                               3     21.3      4.0
   WSW       14.2                                            2     14.2      1.5
     W                                                       0      0.0
   WNW       21.4                                            3     21.4      1.0
    NW                                                       0      0.0
   NNW                                                       0      0.0

  CALM                                                       0      0.0

OL. TOTALS   71.1  21.3    7.1                              14               1.9
        SURFACE WINDS AFTERNOON SEPTEMBER,1978
 DIRECTION   ********* WIND SPEEDS METERS/SECOND *************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

     N                                                       0      0.0
   NNE                                                       0      0.0
    NE                                                       0      0.0
   ENE                                                       0      0.0
     E       23.0                                            3     23.0      1.6
   ESE                                                       0      0.0
    SE                                                       0      0.0
   SSE             15.3                                      2     15.3      4.5
     S              7.6                                      1      7.6      3.6
   SSW             15.3    7.6                               3     22.9      5.7
    SW              7.6    7.6                               2     15.2      5.8
   WSW                                                       0      0.0
     W             15.3                                      2     15.3      4.0
   WNW                                                       0      0.0
    NW                                                       0      0.0
   NNW                                                       0      0.0

  CALM                                                       0      0.0

CL. TOTALS   23.0  61.1   15.2                              13               4.1
```

## FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

100 METER LEVEL WINDS MORNING SEPTEMBER,1978

| DIRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| | ******** WIND SPEEDS METERS/SECOND | ******** | ******** | ******** | ******** | ******** | ******** | ******** | ******** |
| N | 14.2 | | | | | | 2 | 14.2 | 2.0 |
| NNE | | | | | | | 0 | 0.0 | |
| NE | | | | | | | 0 | 0.0 | |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | 7.1 | | | | | | 1 | 7.1 | .7 |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | 7.1 | | | | | 1 | 7.1 | 4.6 |
| S | | | 7.1 | | | | 1 | 7.1 | 6.8 |
| SSW | | 7.1 | | | | | 1 | 7.1 | 3.7 |
| SW | 7.1 | 7.1 | 14.2 | 7.1 | | | 5 | 35.5 | 6.2 |
| WSW | | 7.1 | | | | | 1 | 7.1 | 3.5 |
| W | | | 7.1 | | | | 1 | 7.1 | 6.7 |
| WNW | 7.1 | | | | | | 1 | 7.1 | 2.5 |
| NW | | | | | | | 0 | 0.0 | |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 35.5 | 28.4 | 28.4 | 7.1 | | | 14 | | 4.5 |

100 METER LEVEL WINDS AFTERNOON SEPTEMBER,1978

| DIRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| | ******** WIND SPEEDS METERS/SECOND | ******** | ******** | ******** | ******** | ******** | ******** | ******** | ******** |
| N | | | | | | | 0 | 0.0 | |
| NNE | | | | | | | 0 | 0.0 | |
| NE | | | | | | | 0 | 0.0 | |
| ENE | 15.3 | | | | | | 2 | 15.3 | 1.9 |
| E | 7.6 | | | | | | 1 | 7.6 | 1.9 |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | 7.6 | | | | 1 | 7.6 | 6.4 |
| SSE | | | 7.6 | | | | 1 | 7.6 | 7.9 |
| S | | | | | | | 0 | 0.0 | |
| SSW | | 23.0 | 7.6 | 15.3 | | | 6 | 45.9 | 7.4 |
| SW | | | | | | | 0 | 0.0 | |
| WSW | | | | | | | 0 | 0.0 | |
| W | | | | 7.6 | | | 1 | 7.6 | 10.5 |
| WNW | | | | 7.6 | | | 1 | 7.6 | 10.1 |
| NW | | | | | | | 0 | 0.0 | |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 22.9 | 23.0 | 22.8 | 30.5 | | | 13 | | 6.5 |

```
                FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

00 METER LEVEL WINDS MORNING   SEPTEMBER,1978

DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
             00.1  03.0  06.0  10.0  16.0  GREATER      ROW   SUMMARY
              TO    TO    TO    TO    TO    THAN      TOTAL   TOTAL  AVERAGE
             02.9  05.9  09.9  15.9  25.0   25.0      COUNT  PERCENT  SPEED

   N                                                    0      0.0
  NNE         7.1                                       1      7.1       2.7
   NE                                                   0      0.0
  ENE                                                   0      0.0
   E                                                    0      0.0
  ESE                                                   0      0.0
   SE                                                   0      0.0
  SSE                                                   0      0.0
   S                     14.2                           2     14.2       8.0
  SSW         7.1  14.2   7.1                           4     28.4       4.5
   SW              14.2   7.1                           3     21.3       6.5
  WSW         7.1                                       1      7.1       2.9
   W                      7.1                           1      7.1       8.7
  WNW                                                   0      0.0
   NW                                                   0      0.0
  NNW        14.2                                       2     14.2       1.8

 CALM                                                   0      0.0

L. TOTALS    35.5  28.4  35.5                          14                5.1

00 METER LEVEL WINDS AFTERNOON SEPTEMBER,1978

DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
             00.1  03.0  06.0  10.0  16.0  GREATER      ROW   SUMMARY
              TO    TO    TO    TO    TO    THAN      TOTAL   TOTAL  AVERAGE
             02.9  05.9  09.9  15.9  25.0   25.0      COUNT  PERCENT  SPEED

   N                                                    0      0.0
  NNE                                                   0      0.0
   NE                                                   0      0.0
  ENE         7.6                                       1      7.6       2.4
   E                                                    0      0.0
  ESE         7.6                                       1      7.6       2.0
   SE               7.6                                 1      7.6       3.4
  SSE                           7.6                     1      7.6      10.5
   S          7.6                                       1      7.6       1.2
  SSW               7.6        30.7                     5     38.3      10.8
   SW         7.6                                       1      7.6       2.4
  WSW                                                   0      0.0
   W                            7.6                     1      7.6      10.5
  WNW                                 7.6               1      7.6      19.3
   NW                                                   0      0.0
  NNW                                                   0      0.0

 CALM                                                   0      0.0

L. TOTALS    30.4  15.2        45.9   7.6              13                8.1
```

```
                  FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

   LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

    300 METER LEVEL WINDS MORNING    SEPTEMBER,1978

    DIRECTION   ********** WIND SPEEDS METERS/SECOND *************************
                 00.1   03.0   06.0   10.0   16.0  GREATER       ROW   SUMMARY
                  TO     TO     TO     TO     TO    THAN       TOTAL   TOTAL   AVERAGE
                 02.9   05.9   09.9   15.9   25.0   25.0       COUNT  PERCENT   SPEED

          N                                                      0      0.0
        NNE             7.1                                      1      7.1        3.1
         NE      7.1                                             1      7.1        2.0
        ENE                                                      0      0.0
          E                                                      0      0.0
        ESE                                                      0      0.0
         SE                                                      0      0.0
        SSE                                                      0      0.0
          S                    7.1    7.1                        2     14.2       11.6
        SSW     14.2          14.2    7.1                        5     35.5        5.8
         SW            14.2    7.1                               3     21.3        4.5
        WSW                                                      0      0.0
          W      7.1           7.1                               2     14.2        5.4
        WNW                                                      0      0.0
         NW                                                      0      0.0
        NNW                                                      0      0.0

       CALM                                                      0      0.0

   COL. TOTALS   28.4   21.3   35.5   14.2                        14                 5.8

    300 METER LEVEL WINDS AFTERNOON SEPTEMBER,1978

    DIRECTION   ********** WIND SPEEDS METERS/SECOND *************************
                 00.1   03.0   06.0   10.0   16.0  GREATER       ROW   SUMMARY
                  TO     TO     TO     TO     TO    THAN       TOTAL   TOTAL   AVERAGE
                 02.9   05.9   09.9   15.9   25.0   25.0       COUNT  PERCENT   SPEED

          N                                                      0      0.0
        NNE                                                      0      0.0
         NE                                                      0      0.0
        ENE                                                      0      0.0
          E      7.6                                             1      7.6        1.9
        ESE      7.6                                             1      7.6        2.0
         SE                                                      0      0.0
        SSE             7.6                                      1      7.6        4.7
          S                    7.6                               1      7.6        9.7
        SSW                   15.3   15.3                        4     30.6       10.9
         SW             7.6    7.6                               2     15.2        6.9
        WSW                    7.6                               1      7.6        8.8
          W      7.6                                             1      7.6        1.8
        WNW                                         7.6          1      7.6       28.8
         NW                                                      0      0.0
        NNW                                                      0      0.0

       CALM                                                      0      0.0

   COL. TOTALS   22.8   15.2   38.1   15.3          7.6          13                 8.8
```

```
                FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

CCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

00 METER LEVEL WINDS MORNING   SEPTEMBER,1978

DIRECTION    ********* WIND SPEEDS METERS/SECOND ***************************
              00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
               TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
              02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

     N                                                        0      0.0
   NNE                                                        0      0.0
    NE                                                        0      0.0
   ENE                                                        0      0.0
     E                                                        0      0.0
   ESE                                                        0      0.0
    SE                                                        0      0.0
   SSE                                                        0      0.0
     S                                                        0      0.0
   SSW        7.1   14.2    7.1    7.1    7.1                 6     42.6      7.6
    SW        7.1    7.1                                      2     14.2      3.2
   WSW        7.1           7.1                               2     14.2      3.9
     W               7.1                                      1      7.1      4.9
   WNW              14.2    7.1                               3     21.3      5.5
    NW                                                        0      0.0
   NNW                                                        0      0.0

  CALM                                                        0      0.0

L. TOTALS    21.3   42.6   21.3    7.1    7.1                14               5.8

00 METER LEVEL WINDS AFTERNOON SEPTEMBER,1978

DIRECTION    ********* WIND SPEEDS METERS/SECOND ***************************
              00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
               TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
              02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

     N        7.6                                             1      7.6       .9
   NNE                                                        0      0.0
    NE                                                        0      0.0
   ENE                                                        0      0.0
     E                                                        0      0.0
   ESE                                                        0      0.0
    SE                                                        0      0.0
   SSE               7.6                                      1      7.6      3.9
     S                                                        0      0.0
   SSW        7.6                  7.6                        2     15.2      6.7
    SW       15.3          15.3   15.3                        6     45.9      7.5
   WSW                                                        0      0.0
     W                      7.6                               1      7.6      7.4
   WNW                                    7.6                 1      7.6     18.2
    NW        7.6                                             1      7.6      1.4
   NNW                                                        0      0.0

  CALM                                                        0      0.0

L. TOTALS    38.1    7.6   22.9   22.9    7.6                13               6.9
```

## FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

750 METER LEVEL WINDS MORNING SEPTEMBER,1978

| DIRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| | ********* WIND SPEEDS METERS/SECOND | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** |
| N | | | | | | | 0 | 0.0 | |
| NNE | | | | | | | 0 | 0.0 | |
| NE | | | | | | | 0 | 0.0 | |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | | | | | | 0 | 0.0 | |
| SSW | 15.3 | | | 7.6 | 7.6 | | 4 | 30.5 | 8.8 |
| SW | | | 7.6 | | | | 1 | 7.6 | 6.1 |
| WSW | 7.6 | 7.6 | | | | | 2 | 15.2 | 2.4 |
| W | 7.6 | 15.3 | | | | | 3 | 22.9 | 3.6 |
| WNW | | 7.6 | | 7.6 | | | 2 | 15.2 | 8.4 |
| NW | 7.6 | | | | | | 1 | 7.6 | 2.1 |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 38.1 | 30.5 | 7.6 | 15.2 | 7.6 | | 13 | | 5.8 |

750 METER LEVEL WINDS AFTERNOON SEPTEMBER,1978

| DIRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| | ********* WIND SPEEDS METERS/SECOND | ****** | ****** | ****** | ****** | ****** | ****** | ****** | ****** |
| N | | | | | | | 0 | 0.0 | |
| NNE | | | | | | | 0 | 0.0 | |
| NE | | | | | | | 0 | 0.0 | |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | 8.3 | | | | 1 | 8.3 | 6.6 |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | | 8.3 | | | | 1 | 8.3 | 7.6 |
| SSW | | | | 8.3 | | 8.3 | 2 | 16.6 | 18.2 |
| SW | | 16.6 | 16.6 | 8.3 | | | 5 | 41.5 | 7.2 |
| WSW | | | 8.3 | | | | 1 | 8.3 | 7.1 |
| W | | | 8.3 | | | | 1 | 8.3 | 6.0 |
| WNW | | 8.3 | | | | | 1 | 8.3 | 3.6 |
| NW | | | | | | | 0 | 0.0 | |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | | 24.9 | 49.8 | 16.6 | | 8.3 | 12 | | 8.6 |

```
            FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
00 METER LEVEL WINDS MORNING    SEPTEMBER,1978
DIRECTION   ********* WIND SPEEDS METERS/SECOND ******************************
            00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
             TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
            02.9   05.9   09.9   15.9   25.0    25.0     COUNT  PERCENT   SPEED

   N                                                        0      0.0
  NNE                                                       0      0.0
   NE                                                       0      0.0
  ENE                                                       0      0.0
   E                                                        0      0.0
  ESE                                                       0      0.0
   SE                                                       0      0.0
  SSE                                                       0      0.0
   S                                                        0      0.0
  SSW                               7.6                     1      7.6       24.6
   SW              7.6                                      1      7.6        4.2
  WSW             15.3    7.6                               3     22.9        5.6
   W        7.6          15.3                               3     22.9        6.0
  WNW             15.3           7.6                        3     22.9        6.5
   NW              7.6                                      1      7.6        3.4
  NNW       7.6                                             1      7.6        2.3

 CALM                                                       0      0.0

L. TOTALS   15.2   45.8   22.9   7.6    7.6                13                 6.8
00 METER LEVEL WINDS AFTERNOON SEPTEMBER,1978
DIRECTION   ********* WIND SPEEDS METERS/SECOND ******************************
            00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
             TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
            02.9   05.9   09.9   15.9   25.0    25.0     COUNT  PERCENT   SPEED

   N                                                        0      0.0
  NNE       8.3                                             1      8.3        2.2
   NE                                                       0      0.0
  ENE                                                       0      0.0
   E                                                        0      0.0
  ESE                                                       0      0.0
   SE                                                       0      0.0
  SSE                                                       0      0.0
   S                                                        0      0.0
  SSW                     8.3    8.3    8.3                 3     24.9       12.8
   SW                     8.3    8.3                        2     16.6        9.8
  WSW       8.3    8.3                                      2     16.6        3.7
   W                                                        0      0.0
  WNW             16.6                                      2     16.6        4.5
   NW                     8.3    8.3                        2     16.6       11.5
  NNW                                                       0      0.0

 CALM                                                       0      0.0

L. TOTALS   16.6   24.9   24.9   24.9   8.3                12                 8.3
```

# FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

1500 METER LEVEL WINDS MORNING SEPTEMBER,1978

| DIRECTION | ******** WIND SPEEDS METERS/SECOND | | | | | | ************************ | | |
|---|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
| N | | 8.3 | | | | | 1 | 8.3 | 5.8 |
| NNE | | | | | | | 0 | 0.0 | |
| NE | | | | | | | 0 | 0.0 | |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | | | | | | 0 | 0.0 | |
| SSW | | | | | | 8.3 | 1 | 8.3 | 33.5 |
| SW | | 8.3 | | | | | 1 | 8.3 | 4.2 |
| WSW | | | 8.3 | | | | 1 | 8.3 | 8.7 |
| W | | | | 8.3 | | | 1 | 8.3 | 13.9 |
| WNW | | | 16.6 | 8.3 | | | 3 | 24.9 | 9.6 |
| NW | 8.3 | 8.3 | 16.6 | | | | 4 | 33.2 | 5.6 |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 8.3 | 24.9 | 41.5 | 16.6 | | 8.3 | 12 | | 9.7 |

1500 METER LEVEL WINDS AFTERNOON SEPTEMBER,1978

| DIRECTION | ******** WIND SPEEDS METERS/SECOND | | | | | | ************************ | | |
|---|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
| N | | | | | | | 0 | 0.0 | |
| NNE | | | | | | | 0 | 0.0 | |
| NE | | | | | | | 0 | 0.0 | |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | | | | | | 0 | 0.0 | |
| SSW | | | | | | | 0 | 0.0 | |
| SW | | | 9.0 | | | | 1 | 9.0 | 7.3 |
| WSW | | 9.0 | 18.1 | | | 9.0 | 4 | 36.1 | 12.2 |
| W | | 9.0 | 9.0 | | | | 2 | 18.0 | 5.7 |
| WNW | | 9.0 | | | | | 1 | 9.0 | 3.7 |
| NW | | 9.0 | | 9.0 | | | 2 | 18.0 | 9.6 |
| NNW | | | 9.0 | | | | 1 | 9.0 | 7.6 |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | | 36.0 | 45.1 | 9.0 | | 9.0 | 11 | | 8.9 |

```
             FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
00 METER LEVEL WINDS MORNING    SEPTEMBER,1978
DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
            00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
             TO     TO     TO     TO     TO     THAN       TOTAL   TOTAL   AVERAGE
            02.9   05.9   09.9   15.9   25.0   25.0       COUNT  PERCENT   SPEED

     N                           11.1                         1     11.1     10.2
   NNE                                                        0      0.0
    NE                                                        0      0.0
   ENE                                                        0      0.0
     E                                                        0      0.0
   ESE                                                        0      0.0
    SE                                                        0      0.0
   SSE                                                        0      0.0
     S                                                        0      0.0
   SSW                                                        0      0.0
    SW                    11.1   22.2                         3     33.3      9.7
   WSW                                                        0      0.0
     W                                  11.1                  1     11.1     17.0
   WNW                           11.1                         1     11.1     10.2
    NW                    33.3                                3     33.3      7.5
   NNW                                                        0      0.0

 CALM                                                         0      0.0

L. TOTALS                 44.4   44.4   11.1                  9               9.9
00 METER LEVEL WINDS AFTERNOON SEPTEMBER,1978
DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
            00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
             TO     TO     TO     TO     TO     THAN       TOTAL   TOTAL   AVERAGE
            02.9   05.9   09.9   15.9   25.0   25.0       COUNT  PERCENT   SPEED

     N                                                        0      0.0
   NNE                                                        0      0.0
    NE                                                        0      0.0
   ENE                                                        0      0.0
     E                                                        0      0.0
   ESE                                                        0      0.0
    SE                                                        0      0.0
   SSE                                                        0      0.0
     S                                                        0      0.0
   SSW                                                        0      0.0
    SW             12.5          12.5          12.5           3     37.5     15.9
   WSW                    12.5   12.5                         2     25.0     10.6
     W                           25.0                         2     25.0     12.4
   WNW                    12.5                                1     12.5      7.7
    NW                                                        0      0.0
   NNW                                                        0      0.0

 CALM                                                         0      0.0

L. TOTALS          12.5   25.0   50.0          12.5           8              12.7
```

```
              FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

2500 METER LEVEL WINDS MORNING    SEPTEMBER,1978

  DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
               00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                TO     TO     TO     TO     TO     THAN      TOTAL    TOTAL  AVERAGE
               02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

       N                                                       0       0.0
     NNE                                                       0       0.0
      NE                                                       0       0.0
     ENE                                                       0       0.0
       E                                                       0       0.0
     ESE                                                       0       0.0
      SE                                                       0       0.0
     SSE                                                       0       0.0
       S                                                       0       0.0
     SSW                                                       0       0.0
      SW                                                       0       0.0
     WSW                                                       0       0.0
       W                                                       0       0.0
     WNW                                                       0       0.0
      NW                                                       0       0.0
     NNW                                                       0       0.0

    CALM                                                       0       0.0

COL. TOTALS                                                    0

2500 METER LEVEL WINDS AFTERNOON SEPTEMBER,1978

  DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
               00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                TO     TO     TO     TO     TO     THAN      TOTAL    TOTAL  AVERAGE
               02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

       N                                                       0       0.0
     NNE                                                       0       0.0
      NE                                                       0       0.0
     ENE                                                       0       0.0
       E                                                       0       0.0
     ESE                                                       0       0.0
      SE                                                       0       0.0
     SSE                                                       0       0.0
       S                                                       0       0.0
     SSW                                                       0       0.0
      SW                                                       0       0.0
     WSW                                                       0       0.0
       W                                                       0       0.0
     WNW                                                       0       0.0
      NW                                                       0       0.0
     NNW                                                       0       0.0

    CALM                                                       0       0.0

COL. TOTALS                                                    0
```

```
               FREQUENCY SUMMARY OF INVERSIONS (PERCENTAGES)
 LOCATION: DEER LODGE CC - HIWAY JUNCTION - MET (MAPS)
                MONTH OF SEPTEMBER 1978    MORNING

        **************** INVERSION BASE HEIGHT (METERS) ***************
        SFC   001   101   251   501   751  1001  1501  2001  2501   >
CKNESS         TO    TO    TO    TO    TO   TO    TO    TO    TO  THAN   TOTAL
ETERS)        100   250   500   750  1000  1500  2000  2500  3000  3000

-100  13.7   3.4  10.3   3.4   6.8   3.4   6.8   3.4                     51.2

-250  17.2               6.8   3.4         3.4   3.4                     34.2

-500               3.4   6.8                                             10.2

-750

AL    30.9   3.4  13.7  17.0  10.2   3.4  10.2   6.8

 INVERSION                                                                 3.0

                                                TOTAL NO. OF OCCURENCES       28

VERSION
TYPE

1      3.5   3.5   3.5        10.7         7.1   3.5                     31.8

2      7.1        10.7  10.7         3.5   3.5   3.5                     39.0

3     17.8               7.1                                             24.9

4      3.5                                                                3.5

5

                MONTH OF SEPTEMBER 1978    AFTERNOON

        **************** INVERSION BASE HEIGHT (METERS) ***************
        SFC   001   101   251   501   751  1001  1501  2001  2501   >
CKNESS         TO    TO    TO    TO    TO   TO    TO    TO    TO  THAN   TOTAL
ETERS)        100   250   500   750  1000  1500  2000  2500  3000  3000

-100                     7.1  21.4         7.1   7.1                     42.7

-250                                 7.1         7.1                     14.2

-500                                 7.1                                  7.1

-750

AL                       7.1  21.4  14.2   7.1  14.2

 INVERSION                                                                35.0

                                                TOTAL NO. OF OCCURENCES        9

VERSION
TYPE

1                             33.3  11.1  11.1  11.1                     66.6

2                       11.1        11.1        11.1                     33.3

3

4

5
```

```
                    FREQUENCY SUMMARY OF MIXING HEIGHTS

     LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

    MIXING HEIGHTS -FREQUENCY OF OCCURENCE FOR SEPTEMBER  1978

 MIXING HEIGHT          MORNING              AFTERNOON
   (METERS)           OCCURENCES            OCCURENCES

      0- 100               4                     0

    101- 250               1                     0

    251- 500               3                     1

    501- 750               3                     3

    751-1000               0                     1

   1001-1500               0                     1

       >1500               1                     5

       TOTAL              12                    11


  AVERAGE WIND SPEED
  THROUGH MIXED
  LAYER (M/SEC)          4.7                   7.9


  AVERAGE LAPSE RATE
  BELOW FIRST INVER.
     (DEG C /100M)   -00.47                -01.22
```

```
                 FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
CCATION: DEER LODGE CC - HIWAY JUNCTION - MET (MAPS)
        SURFACE WINDS MORNING      OCTOBER,1978
DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
             00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
              TO     TO     TO     TO     TC      THAN      TOTAL    TOTAL   AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0      COUNT   PERCENT   SPEED

    N         5.0                                              1       5.0       .9
  NNE         5.0                                              1       5.0       .4
   NE                                                          0       0.0
  ENE                                                          0       0.0
    E                                                          0       0.0
  ESE         5.0                                              1       5.0       .4
   SE                                                          0       0.0
  SSE                                                          0       0.0
    S         5.0    5.0                                       2      10.0      2.0
  SSW         5.0                                              1       5.0      1.3
   SW        15.0           5.0                                4      20.0      3.0
  WSW        10.0    5.0                                       3      15.0      2.4
    W         5.0   10.0                                       3      15.0      2.9
  WNW         5.0   10.0                                       3      15.0      3.2
   NW                                                          0       0.0
  NNW         5.0                                              1       5.0       .4

 CALM                                                          0       0.0

L. TOTALS    65.0   30.0    5.0                               20                2.2
        SURFACE WINDS AFTERNOON    OCTOBER,1978
DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
             00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
              TO     TO     TC     TC     TC      THAN      TOTAL    TOTAL   AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0      COUNT   PERCENT   SPEED

    N         5.8    5.8                                       2      11.6      2.7
  NNE        17.6                                              3      17.6      1.0
   NE                                                          0       0.0
  ENE         5.8                                              1       5.8      2.7
    E         5.8                                              1       5.8       .9
  ESE                                                          0       0.0
   SE                                                          0       0.0
  SSE                                                          0       0.0
    S         5.8                                              1       5.8      2.7
  SSW         5.8   11.7                                       3      17.5      3.9
   SW                5.8                                       1       5.8      3.6
  WSW                5.8                                       1       5.8      3.6
    W               11.7                                       2      11.7      5.4
  WNW                       5.8                                1       5.8      8.0
   NW                                                          0       0.0
  NNW         5.8                                              1       5.8      2.2

 CALM                                                          0       0.0

L. TOTALS    52.4   40.8    5.8                               17                3.2
```

```
                 FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

  LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

  100 METER LEVEL WINDS MORNING      OCTOBER,1978

   DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
                00.1  03.0  06.0  10.0  16.0  GREATER       ROW   SUMMARY
                 TO    TO    TO    TO    TO    THAN       TOTAL   TOTAL  AVERAGE
                02.9  05.9  09.9  15.9  25.0   25.0       COUNT  PERCENT  SPEED

         N                                                  0      0.0
       NNE                                                  0      0.0
        NE                                                  0      0.0
       ENE      10.0                                        2     10.0      1.3
         E       5.0                                        1      5.0      1.3
       ESE                                                  0      0.0
        SE                                                  0      0.0
       SSE                                                  0      0.0
         S                        5.0                       1      5.0     12.3
       SSW      10.0   5.0                                  3     15.0      2.9
        SW       5.0  10.0              5.0                 4     20.0      7.2
       WSW       5.0  15.0                                  4     20.0      3.5
         W            10.0   5.0                            3     15.0      4.8
       WNW             5.0   5.0                            2     10.0      6.0
        NW                                                  0      0.0
       NNW                                                  0      0.0

      CALM                                                  0      0.0

  COL. TOTALS   35.0  45.0  10.0   5.0   5.0               20               4.7

  100 METER LEVEL WINDS AFTERNOON    OCTOBER,1978

   DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
                00.1  03.0  06.0  10.0  16.0  GREATER       ROW   SUMMARY
                 TO    TO    TO    TO    TO    THAN       TOTAL   TOTAL  AVERAGE
                02.9  05.9  09.9  15.9  25.0   25.0       COUNT  PERCENT  SPEED

         N             5.8                                  1      5.8      4.5
       NNE      17.6   5.8   5.8                            5     29.2      3.4
        NE      11.7                                        2     11.7      1.8
       ENE       5.8                                        1      5.8      1.7
         E                                                  0      0.0
       ESE                                                  0      0.0
        SE                                                  0      0.0
       SSE                                                  0      0.0
         S                                                  0      0.0
       SSW                       17.6                       3     17.6     10.5
        SW                   5.8                            1      5.8      6.0
       WSW                                                  0      0.0
         W                  11.7  11.7                      4     23.4      9.9
       WNW                                                  0      0.0
        NW                                                  0      0.0
       NNW                                                  0      0.0

      CALM                                                  0      0.0

  COL. TOTALS   35.1  11.6  23.3  29.3                     17               6.1
```

```
             FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

00 METER LEVEL WINDS MORNING      OCTOBER,1978

DIRECTION   ********** WIND SPEEDS METERS/SECOND *****************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

     N                                                       0      0.0
   NNE        5.0                                            1      5.0        .5
    NE                                                       0      0.0
   ENE                                                       0      0.0
     E                                                       0      0.0
   ESE                                                       0      0.0
    SE               5.0                                     1      5.0       3.0
   SSE               5.0                                     1      5.0       5.5
     S               5.0           5.0                       2     10.0       9.0
   SSW        5.0    5.0                                     2     10.0       3.0
    SW       15.0    5.0           5.0                       5     25.0       4.6
   WSW        5.0    5.0                                     2     10.0       4.0
     W                      5.0                              1      5.0       7.2
   WNW               5.0   10.0    5.0                       4     20.0       8.2
    NW        5.0                                            1      5.0        .6
   NNW                                                       0      0.0

  CALM                                                       0      0.0

L. TOTALS    35.0   35.0   15.0   15.0                      20                5.2

00 METER LEVEL WINDS AFTERNOON    OCTOBER,1978

DIRECTION   ********** WIND SPEEDS METERS/SECOND *****************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

     N                                                       0      0.0
   NNE        5.8   11.7    5.8                              4     23.3       3.8
    NE       11.7                                            2     11.7       1.3
   ENE       11.7                                            2     11.7       2.0
     E                                                       0      0.0
   ESE                                                       0      0.0
    SE                                                       0      0.0
   SSE                                                       0      0.0
     S                                                       0      0.0
   SSW                      5.8    5.8                       2     11.6      12.0
    SW        5.8                  5.8                       2     11.6       7.0
   WSW                                                       0      0.0
     W                                            5.8        1      5.8      31.4
   WNW               5.8                  5.8     5.8        3     17.4      17.6
    NW                                                       0      0.0
   NNW        5.8                                            1      5.8        .4

  CALM                                                       0      0.0

L. TOTALS    40.8   17.5   11.6   11.6    5.8    11.6       17                8.5
```

```
               FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

    LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

    300 METER LEVEL WINDS MORNING      OCTOBER,1978

     DIRECTION   ********* WIND SPEEDS METERS/SECOND *************************
                  00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                   TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
                  02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

          N                                                        0      0.0
        NNE                                                        0      0.0
         NE                                                        0      0.0
        ENE                                                        0      0.0
          E                                                        0      0.0
        ESE                                                        0      0.0
         SE                                                        0      0.0
        SSE        5.0                                             1      5.0      1.1
          S        5.0    5.0                                      2     10.0      3.1
        SSW              10.0    5.0                               3     15.0      4.9
         SW        5.0   15.0    5.0                               5     25.0      4.8
        WSW                                                        0      0.0
          W        5.0                                             1      5.0       .9
        WNW        5.0   10.0   15.0    5.0    5.0                 8     40.0      9.1
         NW                                                        0      0.0
        NNW                                                        0      0.0

       CALM                                                        0      0.0

    COL. TOTALS   25.0   40.0   25.0    5.0    5.0                20               6.0

    300 METER LEVEL WINDS AFTERNOON    OCTOBER,1978

     DIRECTION   ********* WIND SPEEDS METERS/SECOND *************************
                  00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                   TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
                  02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

          N               5.8                                      1      5.8      3.5
        NNE       17.6                                             3     17.6      1.2
         NE        5.8   11.7                                      3     17.5      3.7
        ENE                                                        0      0.0
          E                                                        0      0.0
        ESE                                                        0      0.0
         SE                                                        0      0.0
        SSE                                                        0      0.0
          S                      5.8                               1      5.8      8.7
        SSW               5.8    5.8                               2     11.6      6.0
         SW                      5.8                               1      5.8      8.1
        WSW                             5.8                        1      5.8     13.3
          W                                    5.8                 1      5.8     17.7
        WNW               5.8                                      1      5.8      4.0
         NW        5.8                                             1      5.8      1.1
        NNW        5.8    5.8                                      2     11.6      2.8

       CALM                                                        0      0.0

    COL. TOTALS   35.0   34.9   17.4    5.8    5.8                17               5.2
```

FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

OCATION: DEER LODGE CC - HIWAY JUNCTION - MET (MAPS)

OO METER LEVEL WINDS MORNING OCTOBER,1978

DIRECTION ********** WIND SPEEDS METERS/SECOND ****************************

| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| N | | | | | | | 0 | 0.0 | |
| NNE | | | | | | | 0 | 0.0 | |
| NE | | | | | | | 0 | 0.0 | |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | | | | | | 0 | 0.0 | |
| SSW | 5.0 | | | | | | 1 | 5.0 | 2.2 |
| SW | 10.0 | 10.0 | | | 5.0 | | 5 | 25.0 | 5.8 |
| WSW | 5.0 | 15.0 | | | | | 4 | 20.0 | 3.6 |
| W | | 10.0 | 5.0 | | 5.0 | | 4 | 20.0 | 8.6 |
| WNW | | | 10.0 | 5.0 | 5.0 | | 4 | 20.0 | 11.4 |
| NW | 5.0 | | | | | | 1 | 5.0 | 2.8 |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 1 | 5.0 | |
| L. TOTALS | 25.0 | 35.0 | 15.0 | 5.0 | 15.0 | | 20 | | 6.4 |

OO METER LEVEL WINDS AFTERNOON OCTOBER,1978

DIRECTION ********** WIND SPEEDS METERS/SECOND ****************************

| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| N | | | | | | | 0 | 0.0 | |
| NNE | | 5.8 | | | | | 1 | 5.8 | 3.4 |
| NE | | | | | | | 0 | 0.0 | |
| ENE | 5.8 | | | | 5.8 | | 2 | 11.6 | 9.4 |
| E | 5.8 | | | | | | 1 | 5.8 | 2.6 |
| ESE | 5.8 | | | | | | 1 | 5.8 | .4 |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | | | 5.8 | | | 1 | 5.8 | 12.5 |
| SSW | | | | | | | 0 | 0.0 | |
| SW | 5.8 | | | | | | 1 | 5.8 | 1.5 |
| WSW | | | | | | | 0 | 0.0 | |
| W | 5.8 | 17.6 | | 5.8 | | | 5 | 29.2 | 5.8 |
| WNW | 5.8 | 5.8 | | | | | 2 | 11.6 | 2.6 |
| NW | | 5.8 | | | | | 1 | 5.8 | 3.9 |
| NNW | 11.7 | | | | | | 2 | 11.7 | 2.2 |
| CALM | | | | | | | 0 | 0.0 | |
| L. TOTALS | 46.5 | 35.0 | | 11.6 | 5.8 | | 17 | | 4.8 |

```
                 FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
   LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
   750 METER LEVEL WINDS MORNING      OCTOBER,1978

    DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
                 00.1   03.0   06.0   10.0   16.0   GREATER     ROW   SUMMARY
                  TO     TO     TO     TO     TO     THAN     TOTAL   TOTAL   AVERAGE
                 02.9   05.9   09.9   15.9   25.0    25.0     COUNT  PERCENT   SPEED

         N                                                      0      0.0
       NNE                                                      0      0.0
        NE                                                      0      0.0
       ENE                                                      0      0.0
         E                                                      0      0.0
       ESE                                                      0      0.0
        SE                                                      0      0.0
       SSE                      5.2                             1      5.2        6.4
         S       5.2                                            1      5.2        2.8
       SSW                                                      0      0.0
        SW                                                      0      0.0
       WSW      10.5                                            2     10.5        2.6
         W       5.2    5.2    26.3   10.5                      9     47.2        8.4
       WNW                     15.7   15.7                      6     31.4       10.2
        NW                                                      0      0.0
       NNW                                                      0      0.0

      CALM                                                      0      0.0

   COL. TOTALS  20.9    5.2    47.2   26.2                     19                 7.9

   750 METER LEVEL WINDS AFTERNOON    OCTOBER,1978

    DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
                 00.1   03.0   06.0   10.0   16.0   GREATER     ROW   SUMMARY
                  TO     TO     TO     TO     TO     THAN     TOTAL   TOTAL   AVERAGE
                 02.9   05.9   09.9   15.9   25.0    25.0     COUNT  PERCENT   SPEED

         N                                                      0      0.0
       NNE                                                      0      0.0
        NE                                                      0      0.0
       ENE              6.6                                     1      6.6        3.3
         E                                                      0      0.0
       ESE       6.6                                            1      6.6        1.0
        SE                                                      0      0.0
       SSE              6.6                                     1      6.6        3.3
         S       6.6                                            1      6.6        1.7
       SSW                                                      0      0.0
        SW       6.6    6.6                                     2     13.2        4.0
       WSW              6.6                                     1      6.6        5.1
         W              6.6     6.6                             2     13.2        6.5
       WNW       6.6            6.6    6.6    6.6               4     26.4        9.6
        NW       6.6            6.6                             2     13.2        4.6
       NNW                                                      0      0.0

      CALM                                                      0      0.0

   COL. TOTALS  33.0   33.0    19.8    6.6    6.6              15                 5.5
```

```
                FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
00 METER LEVEL WINDS MORNING      OCTOBER,1978
DIRECTION   ********** WIND SPEEDS METERS/SECOND ****************************
            00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
             TO     TO     TO     TO     TO     THAN       TOTAL    TOTAL   AVERAGE
            02.9   05.9   09.9   15.9   25.0    25.0       COUNT   PERCENT   SPEED

     N                                                        0       0.0
   NNE                                                        0       0.0
    NE      5.5                                               1       5.5      2.0
   ENE                                                        0       0.0
     E                                                        0       0.0
   ESE                                                        0       0.0
    SE                                                        0       0.0
   SSE                                                        0       0.0
     S             5.5                                        1       5.5      4.3
   SSW             5.5                                        1       5.5      4.0
    SW                                                        0       0.0
   WSW                                                        0       0.0
     W      5.5    5.5   16.6    5.5   16.6     5.5          10      55.2     13.8
   WNW                   11.1   16.6                          5      27.7      9.6
    NW                                                        0       0.0
   NNW                                                        0       0.0

  CALM                                                        0       0.0

L. TOTALS   11.0   16.5   27.7   22.1   16.6     5.5         18               10.9
00 METER LEVEL WINDS AFTERNOON    OCTOBER,1978
DIRECTION   ********** WIND SPEEDS METERS/SECOND ****************************
            00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
             TO     TO     TO     TO     TO     THAN       TOTAL    TOTAL   AVERAGE
            02.9   05.9   09.9   15.9   25.0    25.0       COUNT   PERCENT   SPEED

     N                                                        0       0.0
   NNE                                                        0       0.0
    NE                                                        0       0.0
   ENE                                                        0       0.0
     E                                                        0       0.0
   ESE                                                        0       0.0
    SE                                                        0       0.0
   SSE                                                        0       0.0
     S                                                        0       0.0
   SSW                                                        0       0.0
    SW      7.1                                               1       7.1      2.2
   WSW             7.1    7.1                                 2      14.2      5.7
     W      7.1    7.1   21.4           7.1                   6      42.7      9.3
   WNW             7.1   14.2    7.1                          4      28.4      8.3
    NW             7.1                                        1       7.1      3.7
   NNW                                                        0       0.0

  CALM                                                        0       0.0

L. TOTALS   14.2   28.4   42.7    7.1    7.1                 14                7.6
```

```
                    FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

1500 METER LEVEL WINDS MORNING      OCTOBER,1978

  DIRECTION   ********* WIND SPEEDS METERS/SECOND ****************************
               00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                TO     TO     TO     TO     TO     THAN      TOTAL    TOTAL   AVERAGE
               02.9   05.9   09.9   15.9   25.0    25.0      COUNT   PERCENT   SPEED

        N                                                      0       0.0
      NNE                                                      0       0.0
       NE                                                      0       0.0
      ENE                                                      0       0.0
        E                                                      0       0.0
      ESE                                                      0       0.0
       SE                                                      0       0.0
      SSE                                                      0       0.0
        S                                                      0       0.0
      SSW                                                      0       0.0
       SW             5.8                                      1       5.8      3.2
      WSW                                                      0       0.0
        W             5.8           5.8            11.7        4      23.3     22.0
      WNW      5.8   11.7    5.8   11.7    5.8      5.8        8      46.6     12.1
       NW                   11.7    5.8    5.8                 4      23.3     12.1
      NNW                                                      0       0.0

     CALM                                                      0       0.0

COL. TOTALS    5.8   23.3   17.5   23.3   11.6     17.5       17               13.9

1500 METER LEVEL WINDS AFTERNOON    OCTOBER,1978

  DIRECTION   ********* WIND SPEEDS METERS/SECOND ****************************
               00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                TO     TO     TO     TO     TO     THAN      TOTAL    TOTAL   AVERAGE
               02.9   05.9   09.9   15.9   25.0    25.0      COUNT   PERCENT   SPEED

        N                                                      0       0.0
      NNE                                                      0       0.0
       NE                                                      0       0.0
      ENE                                                      0       0.0
        E                                                      0       0.0
      ESE                                                      0       0.0
       SE                                                      0       0.0
      SSE                                                      0       0.0
        S                                                      0       0.0
      SSW                                                      0       0.0
       SW                                                      0       0.0
      WSW             7.6           7.6                        2      15.2      6.8
        W            15.3           7.6   15.3      7.6        6      45.8     18.6
      WNW                                  7.6                 1       7.6     16.5
       NW                    7.6   15.3                        3      22.9     10.6
      NNW                           7.6                        1       7.6     11.0

     CALM                                                      0       0.0

COL. TOTALS          22.9    7.6   38.1   22.9      7.6       13               14.2
```

```
              FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

00 METER LEVEL WINDS MORNING      OCTOBER,1978

DIRECTION   ********* WIND SPEEDS METERS/SECOND ****************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN     TOTAL    TOTAL   AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0     COUNT   PERCENT   SPEED

    N                                                        0      0.0
  NNE                                                        0      0.0
   NE                                                        0      0.0
  ENE                                                        0      0.0
    E                                                        0      0.0
  ESE                                                        0      0.0
   SE                                                        0      0.0
  SSE                                                        0      0.0
    S                                                        0      0.0
  SSW                                                        0      0.0
   SW                                                        0      0.0
  WSW                                                        0      0.0
    W         8.3                         8.3     8.3        3     24.9     30.8
  WNW                       8.3           8.3     8.3        3     24.9     16.5
   NW         8.3    8.3   16.6    8.3                       5     41.5      7.1
  NNW                                     8.3                1      8.3     18.2

 CALM                                                        0      0.0

L. TOTALS    16.6    8.3   24.9    8.3   24.9    16.6       12              16.3

00 METER LEVEL WINDS AFTERNOON    OCTOBER,1978

DIRECTION   ********* WIND SPEEDS METERS/SECOND ****************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN     TOTAL    TOTAL   AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0     COUNT   PERCENT   SPEED

    N                                                        0      0.0
  NNE                                                        0      0.0
   NE                                                        0      0.0
  ENE                                                        0      0.0
    E                                                        0      0.0
  ESE                                                        0      0.0
   SE                                                        0      0.0
  SSE                                                        0      0.0
    S                                                        0      0.0
  SSW                                                        0      0.0
   SW                              9.0                       1      9.0     13.8
  WSW                                                        0      0.0
    W                9.0          18.1                       3     27.1     12.2
  WNW                       9.0           9.0                2     18.0     14.4
   NW                                    27.2                3     27.2     19.1
  NNW                9.0    9.0                              2     18.0      7.4

 CALM                                                        0      0.0

L. TOTALS           18.0   18.0   27.1   36.2               11              13.7
```

```
              FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
2500 METER LEVEL WINDS MORNING      OCTOBER,1978
  DIRECTION  ******* - WIND SPEEDS METERS/SECOND *************************
              00.1   03.0   06.0   10.0   16.0  GREATER      ROW   SUMMARY
               TO     TO     TO     TO     TO    THAN      TOTAL   TOTAL  AVERAGE
              02.9   05.9   09.9   15.9   25.0   25.0      COUNT  PERCENT  SPEED

       N                                                      0      0.0
     NNE                                                      0      0.0
      NE                                                      0      0.0
     ENE                                                      0      0.0
       E                                                      0      0.0
     ESE                                                      0      0.0
      SE                                                      0      0.0
     SSE                                                      0      0.0
       S                                                      0      0.0
     SSW                                                      0      0.0
      SW                                                      0      0.0
     WSW                                                      0      0.0
       W                                                      0      0.0
     WNW                                                      0      0.0
      NW                                                      0      0.0
     NNW                                                      0      0.0

    CALM                                                      0      0.0

COL. TOTALS                                                   0
2500 METER LEVEL WINDS AFTERNOON    OCTOBER,1978
  DIRECTION  ******** WIND SPEEDS METERS/SECOND *************************
              00.1   03.0   06.0   10.0   16.0  GREATER      ROW   SUMMARY
               TO     TO     TO     TO     TO    THAN      TOTAL   TOTAL  AVERAGE
              02.9   05.9   09.9   15.9   25.0   25.0      COUNT  PERCENT  SPEED

       N                                                      0      0.0
     NNE                                                      0      0.0
      NE                                                      0      0.0
     ENE                                                      0      0.0
       E                                                      0      0.0
     ESE                                                      0      0.0
      SE                                                      0      0.0
     SSE                                                      0      0.0
       S                                                      0      0.0
     SSW                                                      0      0.0
      SW                                                      0      0.0
     WSW                                                      0      0.0
       W                                                      0      0.0
     WNW                                                      0      0.0
      NW                                                      0      0.0
     NNW                                                      0      0.0

    CALM                                                      0      0.0

COL. TOTALS                                                   0
```

```
                FREQUENCY SUMMARY OF INVERSIONS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

                MONTH OF    OCTOBER 1978     MORNING

        **************** INVERSION BASE HEIGHT (METERS) ***************
        SFC    001    101    251    501    751   1001   1501   2001   2501    >
CKNESS          TO     TO     TO     TO     TO     TO     TO     TO     TO   THAN     TOTAL
ETERS)         100    250    500    750   1000   1500   2000   2500   3000   3000

-100    2.9           1.4    2.9    4.4    4.4    5.8   10.2    1.4                    33.4

-250   17.6           1.4   11.7    2.9    4.4    8.8    7.3                           54.1

-500    4.4                  2.9           1.4    2.9                                  11.6

-750

AL     24.9           2.8   17.5    7.3   10.2   17.5   17.5    1.4

 INVERSION                                                                              0.0

                                                   TOTAL NO. OF OCCURENCES              68

VERSION
TYPE

1                            7.3    2.9    7.3   11.7   11.7    1.4                    42.3

2       2.9                  5.8    1.4    2.9    5.8    5.8                           24.6

3      13.2           2.9    4.4    2.9                                                23.4

4       8.8                                                                             8.8

5

                MONTH OF    OCTOBER 1978     AFTERNOON

        **************** INVERSION BASE HEIGHT (METERS) ***************
        SFC    001    101    251    501    751   1001   1501   2001   2501    >
CKNESS          TO     TO     TO     TO     TO     TO     TO     TO     TO   THAN     TOTAL
ETERS)         100    250    500    750   1000   1500   2000   2500   3000   3000

-100                  3.7   11.1   14.8    3.7   14.8    7.4    3.7                    59.2

-250                  3.7    7.4    3.7    3.7    7.4   11.1                           37.0

-500                         3.7                                                        3.7

-750

AL                    7.4   22.2   18.5    7.4   22.2   18.5    3.7

 INVERSION                                                                              0.0

                                                   TOTAL NO. OF OCCURENCES              27

VERSION
TYPE

1                     7.4   14.8   18.5    7.4   11.1   11.1    3.7                    74.0

2                            7.4                  11.1    7.4                          25.9

3

4

5
```

```
                   FREQUENCY SUMMARY OF MIXING HEIGHTS

      LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

     MIXING HEIGHTS -FREQUENCY OF OCCURENCE FOR   OCTOBER  1978

   MIXING HEIGHT          MORNING               AFTERNOON
    (METERS)            OCCURENCES             OCCURENCES

        0- 100              12                      0

      101- 250               3                      0

      251- 500               1                      1

      501- 750               1                      1

      751-1000               0                      1

     1001-1500               0                      7

         >1500               1                      4

         TOTAL              18                     14

    AVERAGE WIND SPEED
    THROUGH MIXED
    LAYER (M/SEC)          6.6                    7.2

    AVERAGE LAPSE RATE
    BELOW FIRST INVER.
       (DEG C /100M)  -00.99                 -01.69
```

```
                 FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

          SURFACE WINDS MORNING     NOVEMBER,1978

DIRECTION   ********* WIND SPEEDS METERS/SECOND ****************************
             00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN       TOTAL   TOTAL   AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0       COUNT  PERCENT   SPEED

     N              7.6                                       1      7.6      3.1
   NNE              7.6                                       1      7.6      4.5
    NE       7.6                                              1      7.6      1.8
   ENE                                                        0      0.0
     E                                                        0      0.0
   ESE                                                        0      0.0
    SE                                                        0      0.0
   SSE                                                        0      0.0
     S      15.3                                              2     15.3       .8
   SSW       7.6    7.6    7.6    7.6                         4     30.4      5.8
    SW              7.6                                       1      7.6      4.5
   WSW                                                        0      0.0
     W       7.6                                              1      7.6       .9
   WNW                                                        0      0.0
    NW                                                        0      0.0
   NNW                                                        0      0.0

  CALM                                                        2     15.0

L. TOTALS   38.1   30.4    7.6    7.6                        13               3.0

          SURFACE WINDS AFTERNOON   NOVEMBER,1978

DIRECTION   ********* WIND SPEEDS METERS/SECOND ****************************
             00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN       TOTAL   TOTAL   AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0       COUNT  PERCENT   SPEED

     N      10.0                                              1     10.0       .4
   NNE                                                        0      0.0
    NE                                                        0      0.0
   ENE                                                        0      0.0
     E                                                        0      0.0
   ESE      20.0                                              2     20.0      1.3
    SE                                                        0      0.0
   SSE                                                        0      0.0
     S             10.0                                       1     10.0      3.5
   SSW      10.0   10.0                                       2     20.0      2.4
    SW                                                        0      0.0
   WSW      10.0                                              1     10.0       .4
     W                    10.0                                1     10.0      6.7
   WNW                                                        0      0.0
    NW                                                        0      0.0
   NNW                                                        0      0.0

  CALM                                                        2     20.0

L. TOTALS   50.0   20.0   10.0                               10               1.8
```

```
                 FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

 100 METER LEVEL WINDS MORNING     NOVEMBER,1978

  DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
              00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
               TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
              02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

        N                   7.6                               1      7.6      8.1
      NNE                   7.6                               1      7.6      7.8
       NE     7.6                                             1      7.6      1.6
      ENE                                                     0      0.0
        E                                                     0      0.0
      ESE                                                     0      0.0
       SE                                                     0      0.0
      SSE     7.6    7.6                                      2     15.2      2.4
        S     7.6                                             1      7.6       .6
      SSW                          7.6                        1      7.6     14.4
       SW            7.6    7.6   15.3                        4     30.5      9.0
      WSW                                                     0      0.0
        W                                                     0      0.0
      WNW     7.6                                             1      7.6      1.3
       NW                                                     0      0.0
      NNW     7.6                                             1      7.6       .8

    CALM                                                      0      0.0

 COL. TOTALS  38.0   15.2   22.8   22.9                      13               5.8

 100 METER LEVEL WINDS AFTERNOON  NOVEMBER,1978

  DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
              00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
               TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
              02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

        N                                                     0      0.0
      NNE    10.0                                             1     10.0       .6
       NE                                                     0      0.0
      ENE    10.0                                             1     10.0       .6
        E    10.0                                             1     10.0      2.1
      ESE                                                     0      0.0
       SE           10.0                                      1     10.0      4.6
      SSE    10.0                                             1     10.0       .7
        S    10.0   10.0                                      2     20.0      3.4
      SSW                                                     0      0.0
       SW           10.0                                      1     10.0      5.9
      WSW    10.0                                             1     10.0      1.6
        W                  10.0                               1     10.0      6.7
      WNW                                                     0      0.0
       NW                                                     0      0.0
      NNW                                                     0      0.0

    CALM                                                      0      0.0

 COL. TOTALS  60.0   30.0   10.0                             10               2.9
```

```
                FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

00 METER LEVEL WINDS MORNING     NOVEMBER,1978

DIRECTION   ********* WIND SPEEDS METERS/SECOND ****************************
            00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
             TO     TO     TO     TO     TO     THAN      TOTAL    TOTAL   AVERAGE
            02.9   05.9   09.9   15.9   25.0    25.0      COUNT   PERCENT   SPEED

    N                             7.6                        1       7.6     11.9
  NNE       7.6           7.6                                2      15.2      4.2
   NE                                                        0       0.0
  ENE                                                        0       0.0
    E                                                        0       0.0
  ESE                                                        0       0.0
   SE       7.6                                              1       7.6      1.0
  SSE       7.6                                              1       7.6      2.8
    S                                                        0       0.0
  SSW       7.6    7.6    7.6     7.6                        4      30.4      5.9
   SW       7.6                   7.6                        2      15.2      7.1
  WSW       7.6                                              1       7.6       .2
    W       7.6                                              1       7.6       .9
  WNW                                                        0       0.0
   NW                                                        0       0.0
  NNW                                                        0       0.0

 CALM                                                        0       0.0

L. TOTALS   53.2    7.6   15.2   22.8                       13                4.8

00 METER LEVEL WINDS AFTERNOON  NOVEMBER,1978

DIRECTION   ********* WIND SPEEDS METERS/SECOND ****************************
            00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
             TO     TO     TO     TO     TO     THAN      TOTAL    TOTAL   AVERAGE
            02.9   05.9   09.9   15.9   25.0    25.0      COUNT   PERCENT   SPEED

    N                                                        0       0.0
  NNE             10.0                                       1      10.0      3.1
   NE                                                        0       0.0
  ENE                                                        0       0.0
    E                                                        0       0.0
  ESE      10.0                                              1      10.0       .9
   SE                                                        0       0.0
  SSE             20.0                                       2      20.0      3.2
    S      10.0                                              1      10.0      1.2
  SSW             10.0                                       1      10.0      5.5
   SW      10.0                                              1      10.0      2.3
  WSW                                                        0       0.0
    W      10.0          10.0                                2      20.0      5.1
  WNW                                                        0       0.0
   NW                                                        0       0.0
  NNW      10.0                                              1      10.0      2.6

 CALM                                                        0       0.0

L. TOTALS   50.0   40.0   10.0                              10                3.4
```

```
              FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
   LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
   300 METER LEVEL WINDS MORNING     NOVEMBER,1978
    DIRECTION   ********* WIND SPEEDS METERS/SECOND *************************
                 00.1   03.0   06.0   10.0   16.0  GREATER      ROW   SUMMARY
                  TO     TO     TO     TO     TO    THAN       TOTAL   TOTAL  AVERAG
                 02.9   05.9   09.9   15.9   25.0   25.0       COUNT  PERCENT  SPEED

          N                                                      0      0.0
        NNE                         15.3                         2     15.3    12.7
         NE                                                      0      0.0
        ENE                                                      0      0.0
          E                                                      0      0.0
        ESE                                                      0      0.0
         SE                                                      0      0.0
        SSE      7.6                                             1      7.6     2.2
          S      7.6    7.6                                      2     15.2     2.6
        SSW      7.6                                             1      7.6     2.5
         SW      7.6   23.0    7.6                               5     38.2     4.3
        WSW                    7.6                               1      7.6     8.4
          W      7.6                                             1      7.6     1.3
        WNW                                                      0      0.0
         NW                                                      0      0.0
        NNW                                                      0      0.0

       CALM                                                      0      0.0

  COL. TOTALS   38.0   30.6   15.2   15.3                       13              5.1
   300 METER LEVEL WINDS AFTERNOON   NOVEMBER,1978
    DIRECTION   ********* WIND SPEEDS METERS/SECOND *************************
                 00.1   03.0   06.0   10.0   16.0  GREATER      ROW   SUMMARY
                  TO     TO     TO     TO     TO    THAN       TOTAL   TOTAL  AVERAGE
                 02.9   05.9   09.9   15.9   25.0   25.0       COUNT  PERCENT  SPEED

          N     10.0                                             1     10.0     2.7
        NNE                                                      0      0.0
         NE                                                      0      0.0
        ENE     10.0                                             1     10.0     1.3
          E                                                      0      0.0
        ESE                                                      0      0.0
         SE                                                      0      0.0
        SSE                                                      0      0.0
          S                                                      0      0.0
        SSW     10.0   10.0   10.0                               3     30.0     5.0
         SW                                                      0      0.0
        WSW     10.0   10.0                                      2     20.0     2.9
          W                   20.0                               2     20.0     9.2
        WNW            10.0                                      1     10.0     4.6
         NW                                                      0      0.0
        NNW                                                      0      0.0

       CALM                                                      0      0.0

  COL. TOTALS   40.0   30.0   30.0                              10              4.8
```

```
               FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
00 METER LEVEL WINDS MORNING     NOVEMBER,1978
DIRECTION   ********* WIND SPEEDS METERS/SECOND *******************************
            00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
             TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
            02.9   05.9   09.9   15.9   25.0    25.0      COUNT   PERCENT  SPEED

     N              7.6           7.6                         2     15.2      8.9
   NNE                     7.6                                1      7.6      9.5
    NE                                                        0      0.0
   ENE       7.6                                              1      7.6      1.8
     E                                                        0      0.0
   ESE                                                        0      0.0
    SE                                                        0      0.0
   SSE              7.6                                       1      7.6      5.4
     S                                                        0      0.0
   SSW                                                        0      0.0
    SW       7.6    7.6   23.0                                5     38.2      5.6
   WSW       7.6                                              1      7.6       .5
     W              7.6                                       1      7.6      4.5
   WNW                                                        0      0.0
    NW                                                        0      0.0
   NNW              7.6                                       1      7.6      4.2

  CALM                                                        0      0.0

L. TOTALS   22.8   38.0   30.6   7.6                         13               5.5
00 METER LEVEL WINDS AFTERNOON   NOVEMBER,1978
DIRECTION   ********* WIND SPEEDS METERS/SECOND *******************************
            00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
             TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
            02.9   05.9   09.9   15.9   25.0    25.0      COUNT   PERCENT  SPEED

     N                                                        0      0.0
   NNE                                                        0      0.0
    NE      10.0                                              1     10.0      2.5
   ENE                                                        0      0.0
     E                                                        0      0.0
   ESE                                                        0      0.0
    SE                                                        0      0.0
   SSE                                                        0      0.0
     S      20.0                                              2     20.0      2.5
   SSW             10.0                                       1     10.0      5.4
    SW             10.0                                       1     10.0      4.3
   WSW                                                        0      0.0
     W             10.0   30.0                                4     40.0      6.7
   WNW             10.0                                       1     10.0      5.7
    NW                                                        0      0.0
   NNW                                                        0      0.0

  CALM                                                        0      0.0

L. TOTALS   30.0   40.0   30.0                               10               5.0
```

```
                FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
 750 METER LEVEL WINDS MORNING     NOVEMBER,1978

  DIRECTION    ******** WIND SPEEDS METERS/SECOND ****************************
               00.1  03.0  06.0  10.0  16.0  GREATER      ROW   SUMMARY
                TO    TO    TO    TO    TO     THAN      TOTAL   TOTAL  AVERAGE
               02.9  05.9  09.9  15.9  25.0    25.0      COUNT  PERCENT  SPEED

       N                    8.3                             1      8.3     6.5
     NNE                                                    0      0.0
      NE                    8.3                             1      8.3     8.0
     ENE                                                    0      0.0
       E                                                    0      0.0
     ESE                                                    0      0.0
      SE                                                    0      0.0
     SSE                                                    0      0.0
       S             16.6                                   2     16.6     3.7
     SSW                                                    0      0.0
      SW                                                    0      0.0
     WSW                                                    0      0.0
       W             25.0   8.3   8.3                       5     41.6     7.5
     WNW              8.3         8.3                       2     16.6     8.3
      NW                                                    0      0.0
     NNW        8.3                                         1      8.3     2.7

    CALM                                                    0      0.0

 COL. TOTALS    8.3  49.9  24.9  16.6                      12              6.5
 750 METER LEVEL WINDS AFTERNOON  NOVEMBER,1978

  DIRECTION    ******** WIND SPEEDS METERS/SECOND ****************************
               00.1  03.0  06.0  10.0  16.0  GREATER      ROW   SUMMARY
                TO    TC    TO    TO    TO     THAN      TOTAL   TOTAL  AVERAGE
               02.9  05.9  09.9  15.9  25.0    25.0      COUNT  PERCENT  SPEED

       N                                                    0      0.0
     NNE       10.0                                         1     10.0      .6
      NE                                                    0      0.0
     ENE                                                    0      0.0
       E                                                    0      0.0
     ESE                                                    0      0.0
      SE                                                    0      0.0
     SSE             10.0                                   1     10.0     5.8
       S                                                    0      0.0
     SSW             10.0                                   1     10.0     4.9
      SW                                                    0      0.0
     WSW                         10.0                       1     10.0    12.6
       W             10.0        20.0  10.0                 4     40.0    10.8
     WNW             10.0  10.0                             2     20.0     6.2
      NW                                                    0      0.0
     NNW                                                    0      0.0

    CALM                                                    0      0.0

 COL. TOTALS   10.0  40.0  10.0  30.0  10.0                10              7.9
```

```
                    FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
OCATION: DEER LODGE CC - HIWAY JUNCTION - MET (MAPS)
00 METER LEVEL WINDS MORNING     NOVEMBER,1978
DIRECTION   ********* WIND SPEEDS METERS/SECOND ****************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
             02.9   05.9   09.9   15.9   25.0   25.0      COUNT  PERCENT  SPEED

     N       10.0                                            1     10.0      2.8
   NNE                                                       0      0.0
    NE                            10.0                       1     10.0     10.7
   ENE                                                       0      0.0
     E                                                       0      0.0
   ESE                                                       0      0.0
    SE                                                       0      0.0
   SSE                                                       0      0.0
     S                                                       0      0.0
   SSW              10.0   10.0                              2     20.0      5.5
    SW                                                       0      0.0
   WSW                                                       0      0.0
     W                     20.0                              2     20.0      8.3
   WNW                     20.0   20.0                       4     40.0     10.0
    NW                                                       0      0.0
   NNW                                                       0      0.0

 CALM                                                        0      0.0

L. TOTALS    10.0   10.0   50.0   30.0                      10               8.1
00 METER LEVEL WINDS AFTERNOON   NOVEMBER,1978
DIRECTION   ********* WIND SPEEDS METERS/SECOND ****************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
             02.9   05.9   09.9   15.9   25.0   25.0      COUNT  PERCENT  SPEED

     N                                                       0      0.0
   NNE                                                       0      0.0
    NE                                                       0      0.0
   ENE                                                       0      0.0
     E                                                       0      0.0
   ESE       14.2                                            1     14.2      1.6
    SE              14.2                                     1     14.2      3.6
   SSE                                                       0      0.0
     S                                                       0      0.0
   SSW                                                       0      0.0
    SW                                                       0      0.0
   WSW                                                       0      0.0
     W                            14.2   28.5                3     42.7  [illegible]
   WNW                     14.2   14.2                       2     28.4  [illegible]
    NW                                                       0      0.0
   NNW                                                       0      0.0

 CALM                                                        0      0.0

L. TOTALS    14.2   14.2   14.2   28.4   28.5                7              11.6
```

```
              FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
  LOCATION: DEER LODGE CC - HIWAY JUNCTION - MET (MAPS)
 1500 METER LEVEL WINDS MORNING    NOVEMBER,1978

   DIRECTION   ********* WIND SPEEDS METERS/SECOND *************************
               00.1   03.0   06.0   10.0   16.0  GREATER      ROW  SUMMARY
                TO     TO     TO     TO     TO    THAN      TOTAL   TOTAL  AVERAGE
               02.9   05.9   09.9   15.9   25.0   25.0      COUNT  PERCENT  SPEED

         N            11.1                                    1     11.1     4.9
       NNE                                                    0      0.0
        NE                                                    0      0.0
       ENE                                                    0      0.0
         E                                                    0      0.0
       ESE                                                    0      0.0
        SE                                                    0      0.0
       SSE                                                    0      0.0
         S            11.1                                    1     11.1     3.5
       SSW                                                    0      0.0
        SW                                                    0      0.0
       WSW     11.1                                           1     11.1     2.0
         W                                33.3                3     33.3    18.3
       WNW                   11.1                             1     11.1     6.3
        NW                          11.1  11.1                2     22.2    15.2
       NNW                                                    0      0.0

      CALM                                                    0      0.0

 COL. TOTALS   11.1   22.2   11.1   11.1  44.4                9             11.3
 1500 METER LEVEL WINDS AFTERNOON  NOVEMBER,1978

   DIRECTION   ********* WIND SPEEDS METERS/SECOND *************************
               00.1   03.0   06.0   10.0   16.0  GREATER      ROW  SUMMARY
                TO     TO     TO     TO     TO    THAN      TOTAL   TOTAL  AVERAGE
               02.9   05.9   09.9   15.9   25.0   25.0      COUNT  PERCENT  SPEED

         N                                                    0      0.0
       NNE                                                    0      0.0
        NE                                                    0      0.0
       ENE                                                    0      0.0
         E                                                    0      0.0
       ESE                                                    0      0.0
        SE                                                    0      0.0
       SSE                                                    0      0.0
         S                   20.0                             1     20.0     9.0
       SSW                                                    0      0.0
        SW                                                    0      0.0
       WSW                                                    0      0.0
         W                   20.0                             1     20.0     7.7
       WNW                                                    0      0.0
        NW            20.0   20.0   20.0                      3     60.0     8.2
       NNW                                                    0      0.0

      CALM                                                    0      0.0

 COL. TOTALS          20.0   60.0   20.0                      5              8.2
```

```
          FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
OCATION: DEER LODGE CC - HIWAY JUNCTION - MET (MAPS)
00 METER LEVEL WINDS MORNING     NOVEMBER,1978
IRECTION   ********* WIND SPEEDS METERS/SECOND *************************
         00.1  03.0  06.0  10.0  16.0  GREATER      ROW   SUMMARY
          TO    TO    TO    TO    TO    THAN      TOTAL   TOTAL   AVERAGE
         02.9  05.9  09.9  15.9  25.0   25.0      COUNT  PERCENT   SPEED

   N                                                0      0.0
 NNE                                                0      0.0
  NE                                                0      0.0
 ENE                                                0      0.0
   E                                                0      0.0
 ESE                                                0      0.0
  SE                                                0      0.0
 SSE                                                0      0.0
   S                                                0      0.0
 SSW           16.6                                 1     16.6       3.3
  SW                                                0      0.0
 WSW                                                0      0.0
   W           16.6                    16.6         2     33.2      15.9
 WNW                 16.6                           1     16.6       6.8
  NW                                   16.6         1     16.6      28.5
 NNW                 16.6                           1     16.6       8.0

CALM                                                0      0.0

L. TOTALS      33.2  33.2                  33.2     6               13.0
00 METER LEVEL WINDS AFTERNOON  NOVEMBER,1978
IRECTION   ********* WIND SPEEDS METERS/SECOND *************************
         00.1  03.0  06.0  10.0  16.0  GREATER      ROW   SUMMARY
          TO    TO    TO    TO    TO    THAN      TOTAL   TOTAL   AVERAGE
         02.9  05.9  09.9  15.9  25.0   25.0      COUNT  PERCENT   SPEED

   N                 20.0  20.0                     2     40.0      10.3
 NNE                                                0      0.0
  NE                                                0      0.0
 ENE                                                0      0.0
   E                                                0      0.0
 ESE                                                0      0.0
  SE                                                0      0.0
 SSE                                                0      0.0
   S                 20.0                           1     20.0       6.3
 SSW                                                0      0.0
  SW                                                0      0.0
 WSW                                                0      0.0
   W                             20.0               1     20.0      22.8
 WNW                                                0      0.0
  NW                                                0      0.0
 NNW           20.0                                 1     20.0       5.1

CALM                                                0      0.0

L. TOTALS      20.0  40.0  20.0  20.0               5               11.0
```

```
                    FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
   LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAFS)
  2500 METER LEVEL WINDS MORNING     NOVEMBER,1978

    DIRECTION    ********* WIND SPEEDS METERS/SECOND ***************************
                  00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
                   TO     TO     TO     TO     TO     THAN       TOTAL    TOTAL  AVERAGE
                  02.9   05.9   09.9   15.9   25.0    25.0       COUNT  PERCENT   SPEED

         N                                                         0       0.0
       NNE                                                         0       0.0
        NE                                                         0       0.0
       ENE                                                         0       0.0
         E                                                         0       0.0
       ESE                                                         0       0.0
        SE                                                         0       0.0
       SSE                                                         0       0.0
         S                                                         0       0.0
       SSW                                                         0       0.0
        SW                                                         0       0.0
       WSW                                                         0       0.0
         W                                                         0       0.0
       WNW                                           100.0         1     100.0      30.8
        NW                                                         0       0.0
       NNW                                                         0       0.0

      CALM                                                         0       0.0

  COL. TOTALS                                        100.0         1                30.8
  2500 METER LEVEL WINDS AFTERNOON   NOVEMBER,1978

    DIRECTION    ********* WIND SPEEDS METERS/SECOND ***************************
                  00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
                   TO     TO     TO     TO     TO     THAN       TOTAL    TOTAL  AVERAGE
                  02.9   05.9   09.9   15.9   25.0    25.0       COUNT  PERCENT   SPEED

         N                                                         0       0.0
       NNE                                                         0       0.0
        NE                                                         0       0.0
       ENE                                                         0       0.0
         E                                                         0       0.0
       ESE                                                         0       0.0
        SE                                                         0       0.0
       SSE                                                         0       0.0
         S                                                         0       0.0
       SSW                                                         0       0.0
        SW                                                         0       0.0
       WSW                                                         0       0.0
         W                                                         0       0.0
       WNW                                                         0       0.0
        NW                                                         0       0.0
       NNW                                                         0       0.0

      CALM                                                         0       0.0

  COL. TOTALS                                                      0
```

```
             FREQUENCY SUMMARY OF INVERSIONS (PERCENTAGES)
LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
               MONTH OF  NOVEMBER 1978    MORNING

      ***************  INVERSION BASE HEIGHT (METERS) ***************
      SFC   001   101   251   501   751  1001  1501  2001  2501     >
KNESS        TO    TO    TO    TO    TO    TO    TO    TO    TO  THAN   TOTAL
TERS)       100   250   500   750  1000  1500  2000  2500  3000  3000

100  10.2   2.5  10.2   5.1   7.6        12.8   7.6                      56.0

250   7.6         2.5                     5.1   2.5                      17.7

500                     2.5   5.1               7.6                      15.2

750   2.5   2.5               2.5                                         7.5

L    20.3   5.0  12.7   7.6  15.2        17.9  17.7

INVERSION                                                                 2.0

                                               TOTAL NO. OF OCCURENCES     38

ERSION
YPE

      2.6   2.6   2.6   2.6   7.8         5.2  10.5                      33.9

      7.8         7.8   2.6   5.2        10.5   7.8                      41.7

      5.2   2.6   2.6   2.6               2.6                            15.6

      5.2                     2.6                                         7.8


               MONTH OF  NOVEMBER 1978    AFTERNOON

      ***************  INVERSION BASE HEIGHT (METERS) ***************
      SFC   001   101   251   501   751  1001  1501  2001  2501     >
KNESS        TO    TO    TO    TO    TO    TO    TO    TO    TO  THAN   TOTAL
TERS)       100   250   500   750  1000  1500  2000  2500  3000  3000

100   7.6         3.8   7.6              26.9   3.8                      49.7

250         3.8   3.8   3.8   7.6         3.8  15.3                      38.1

500               3.8                     3.8                             7.6

750

L     7.6   3.8  11.4  11.4   7.6        34.5  19.1

INVERSION                                                                 3.0

                                               TOTAL NO. OF OCCURENCES     25

ERSION
YPE

                        8.0              16.0  12.0                      36.0

            4.0   4.0                    20.0   8.0                      36.0

      8.0         8.0   4.0   8.0                                        28.0
```

```
                    FREQUENCY SUMMARY OF MIXING HEIGHTS

       LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

      MIXING HEIGHTS -FREQUENCY OF OCCURENCE FOR  NOVEMBER  1978

    MIXING HEIGHT          MORNING              AFTERNOON
     (METERS)            OCCURENCES            OCCURENCES

        0- 100                 3                     0

      101- 250                 4                     0

      251- 500                 0                     3

      501- 750                 1                     1

      751-1000                 1                     0

     1001-1500                 4                     1

         >1500                 0                     1

         TOTAL                13                     6


     AVERAGE WIND SPEED
     THROUGH MIXED
     LAYER (M/SEC)           5.0                   4.2


     AVERAGE LAPSE RATE
     BELOW FIRST INVER.
        (DEG C /100M)   -02.72                -02.64
```

```
                    FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
OCATION: DEER LODGE CL - HIWAY JUNCTION - MET (MAPS)
          SURFACE WINDS MORNING     DECEMBER,1978
DIRECTION    ********** WIND SPEEDS METERS/SECOND ******************************
                  00.1     03.0     06.0     10.0     16.0    GREATER        ROW    SUMMARY
                   TO       TO       TO       TO       TO      THAN         TOTAL   TOTAL   AVERAGE
                  02.9     05.9     09.9     15.9     25.0     25.0         COUNT  PERCENT   SPEED

      N            5.8                                                         1      5.8      1.2
    NNE                                                                        0      0.0
     NE           11.7                                                         2     11.7       .4
    ENE                                                                        0      0.0
      E                                                                        0      0.0
    ESE                                                                        0      0.0
     SE                                                                        0      0.0
    SSE            5.8                                                         1      5.8       .4
      S                                                                        0      0.0
    SSW            5.8     11.7      5.8      5.8                              5     29.1      6.5
     SW            5.8                        5.8                              2     11.6      6.0
    WSW                                                                        0      0.0
      W            5.8     11.7               5.8                              4     23.3      5.7
    WNW                                                                        0      0.0
     NW                                                                        0      0.0
    NNW                                                                        0      0.0

  CALM                                                                         2     11.0

. TOTALS          40.7     23.4      5.8     17.4                             17               4.1
          SURFACE WINDS AFTERNOON   DECEMBER,1978
DIRECTION    ********** WIND SPEEDS METERS/SECOND ******************************
                  00.1     03.0     06.0     10.0     16.0    GREATER        ROW    SUMMARY
                   TO       TO       TO       TO       TO      THAN         TOTAL   TOTAL   AVERAGE
                  02.9     05.9     09.9     15.9     25.0     25.0         COUNT  PERCENT   SPEED

      N           15.3                                                         2     15.3      1.8
    NNE            7.6                                                         1      7.6       .9
     NE                                                                        0      0.0
    ENE                                                                        0      0.0
      E                                                                        0      0.0
    ESE                                                                        0      0.0
     SE                                                                        0      0.0
    SSE                                                                        0      0.0
      S                                                                        0      0.0
    SSW                              7.6                                       1      7.6      6.7
     SW                              7.6                                       1      7.6      8.9
    WSW                                                                        0      0.0
      W                     23.0     7.6                                       4     30.6      5.1
    WNW                      7.6     7.6                                       2     15.2      5.1
     NW                                                                        0      0.0
    NNW            7.6                                                         1      7.6      1.3

  CALM                                                                         1      7.0

. TOTALS          30.5     30.6     30.4                                      13               4.0
```

```
                       FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

 LOCATION: DEER LODGE CC - HIWAY JUNCTION - MET (MAPS)

 100 METER LEVEL WINDS MORNING     DECEMBER,1978

  DIRECTION   ********* WIND SPEEDS METERS/SECOND *************************
                00.1  03.0  06.0  10.0  16.0  GREATER   ROW   SUMMARY
                 TO    TO    TO    TO    TO    THAN    TOTAL   TOTAL  AVERAG
                02.9  05.9  09.9  15.9  25.0   25.0    COUNT  PERCENT  SPEED

      N                                                      0     0.0
    NNE          5.8                                         1     5.8     2.7
     NE         11.7                                         2    11.7     1.6
    ENE                                                      0     0.0
      E          5.8                                         1     5.8     2.2
    ESE                                                      0     0.0
     SE                                                      0     0.0
    SSE                                                      0     0.0
      S                                                      0     0.0
    SSW                5.8         11.7                      3    17.5    10.6
     SW          5.8         5.8    5.8                      3    17.4     7.3
    WSW                5.8                                   1     5.8     3.6
      W                            11.7                      2    11.7    13.1
    WNW                      5.8    5.8                      2    11.6    11.1
     NW          5.8                                         1     5.8     2.2
    NNW                      5.8                             1     5.8     6.5

   CALM                                                      0     0.0

COL. TOTALS     34.9  11.6  17.4  35.0                      17             7.2

 100 METER LEVEL WINDS AFTERNOON   DECEMBER,1978

  DIRECTION   ********* WIND SPEEDS METERS/SECOND *************************
                00.1  03.0  06.0  10.0  16.0  GREATER   ROW   SUMMARY
                 TO    TO    TO    TO    TO    THAN    TOTAL   TOTAL  AVERAG
                02.9  05.9  09.9  15.9  25.0   25.0    COUNT  PERCENT  SPEED

      N                                                      0     0.0
    NNE                     23.0                             3    23.0     7.2
     NE                                                      0     0.0
    ENE                                                      0     0.0
      E          7.6                                         1     7.6      .6
    ESE                                                      0     0.0
     SE                                                      0     0.0
    SSE                                                      0     0.0
      S                                                      0     0.0
    SSW          7.6         7.6                             2    15.2     5.3
     SW                      7.6                             1     7.6     8.3
    WSW                                                      0     0.0
      W                     15.3    7.6                      3    22.9     8.7
    WNW               15.3   7.6                             3    22.9     5.4
     NW                                                      0     0.0
    NNW                                                      0     0.0

   CALM                                                      0     0.0

COL. TOTALS     15.2  15.3  61.1   7.6                      13             6.4
```

```
                FREQUENCY  SUMMARY  OF  UPPER  LEVEL  WINDS  (PERCENTAGES)
OCATION:  DEER  LODGE  CO  -  HIWAY  JUNCTION  -  MET  (MAPS)
00  METER  LEVEL  WINDS  MORNING     DECEMBER,1978
IRECTION    *********  WIND  SPEEDS  METERS/SECOND  ***************************
            00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
             TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
            02.9   05.9   09.9   15.9   25.0    25.0     COUNT   PERCENT  SPEED

    N                5.8    5.8                              2      11.6     6.5
  NNE                                                        0       0.0
   NE                                                        0       0.0
  ENE                                                        0       0.0
    E                                                        0       0.0
  ESE                                                        0       0.0
   SE                                                        0       0.0
  SSE                                                        0       0.0
    S        5.8                                             1       5.8     1.6
  SSW               5.8                                      1       5.8     4.4
   SW              17.6          11.7                        5      29.3     8.3
  WSW        5.8    5.8                                      2      11.6     2.9
    W        5.8                 17.6                        4      23.4    11.1
  WNW        5.8           5.8                               2      11.6     4.6
   NW                                                        0       0.0
  NNW                                                        0       0.0

 CALM                                                        0       0.0

L. TOTALS   23.2   35.0   11.6   29.3                       17               7.0
00  METER  LEVEL  WINDS  AFTERNOON   DECEMBER,1978
IRECTION    *********  WIND  SPEEDS  METERS/SECOND  ***************************
            00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
             TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
            02.9   05.9   09.9   15.9   25.0    25.0     COUNT   PERCENT  SPEED

    N                                                        0       0.0
  NNE                     15.3                               2      15.3     7.3
   NE                                                        0       0.0
  ENE                                                        0       0.0
    E                                                        0       0.0
  ESE                                                        0       0.0
   SE                                                        0       0.0
  SSE        7.6                                             1       7.6     2.7
    S                                                        0       0.0
  SSW               7.6                                      1       7.6     3.9
   SW                     15.3                               2      15.3     7.5
  WSW                                                        0       0.0
    W               7.6   15.3           7.6                 4      30.5    10.4
  WNW               7.6    7.6                               2      15.2     7.5
   NW               7.6                                      1       7.6     4.1
  NNW                                                        0       0.0

 CALM                                                        0       0.0

L. TOTALS    7.6   30.4   53.5           7.6                13               7.4
```

FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

300 METER LEVEL WINDS MORNING DECEMBER,1978

| DIRECTION | ********* WIND SPEEDS METERS/SECOND ******************************** | | | | | | ROW | SUMMARY | |
|---|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | TOTAL COUNT | TOTAL PERCENT | AVERAG SPEED |
| N | | | | 5.8 | | | 1 | 5.8 | 11.4 |
| NNE | | | 5.8 | | | | 1 | 5.8 | 7.0 |
| NE | | | | | | | 0 | 0.0 | |
| ENE | 5.8 | | | | | | 1 | 5.8 | .1 |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | 5.8 | | | | | 1 | 5.8 | 5.3 |
| SSW | | 11.7 | | | | | 2 | 11.7 | 4.4 |
| SW | 5.8 | 5.8 | | 5.8 | | | 3 | 17.4 | 6.1 |
| WSW | 5.8 | | 5.8 | | 5.8 | | 3 | 17.4 | 8.7 |
| W | | 5.8 | | | 11.7 | | 3 | 17.5 | 16.7 |
| WNW | 5.8 | | 5.8 | | | | 2 | 11.6 | 6.1 |
| NW | | | | | | | 0 | 0.0 | |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 23.2 | 29.1 | 17.4 | 11.6 | 17.5 | | 17 | | 8.2 |

300 METER LEVEL WINDS AFTERNOON DECEMBER,1978

| DIRECTION | ********* WIND SPEEDS METERS/SECOND ******************************** | | | | | | ROW | SUMMARY | |
|---|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | TOTAL COUNT | TOTAL PERCENT | AVERAG SPEED |
| N | | | | | | | 0 | 0.0 | |
| NNE | | | 7.6 | | | | 1 | 7.6 | 6.7 |
| NE | | | | | | | 0 | 0.0 | |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | | | | | | 0 | 0.0 | |
| SSW | | 7.6 | | | | 7.6 | 2 | 15.2 | 19.8 |
| SW | 7.6 | | | | | | 1 | 7.6 | 2.8 |
| WSW | | 15.3 | | 7.6 | | | 3 | 22.9 | 7.2 |
| W | | | 23.0 | | | | 3 | 23.0 | 8.7 |
| WNW | | | 15.3 | | | | 2 | 15.3 | 8.0 |
| NW | | | 7.6 | | | | 1 | 7.6 | 6.3 |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 7.6 | 22.9 | 53.5 | 7.6 | | 7.6 | 13 | | 9.1 |

```
                FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
OCATION: DEER LODGE CC - HIWAY JUNCTION - MET (MAPS)
00 METER LEVEL WINDS MORNING     DECEMBER,1978
DIRECTION    ********** WIND SPEEDS METERS/SECOND ******************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN      TOTAL    TOTAL   AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0      COUNT   PERCENT   SPEED

      N             6.2                                        1       6.2      3.6
    NNE                    6.2    6.2                          2      12.4     10.4
     NE                                                        0       0.0
    ENE                                                        0       0.0
      E                                                        0       0.0
    ESE                                                        0       0.0
     SE                                                        0       0.0
    SSE                                                        0       0.0
      S      6.2    6.2                                        2      12.4      3.1
    SSW                                                        0       0.0
     SW            12.5                  6.2                   3      18.7      8.3
    WSW             6.2                                        1       6.2      5.9
      W      6.2           6.2           6.2      6.2          4      24.8     21.3
    WNW      6.2    6.2    6.2                                 3      18.6      4.5
     NW                                                        0       0.0
    NNW                                                        0       0.0

   CALM                                                        0       0.0

L. TOTALS   18.6   37.3   18.6    6.2   12.4      6.2         16               10.0
00 METER LEVEL WINDS AFTERNOON   DECEMBER,1978
DIRECTION    ********** WIND SPEEDS METERS/SECOND ******************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN      TOTAL    TOTAL   AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0      COUNT   PERCENT   SPEED

      N                    8.3                                 1       8.3      7.6
    NNE                                                        0       0.0
     NE                                                        0       0.0
    ENE                                                        0       0.0
      E                                                        0       0.0
    ESE                                                        0       0.0
     SE                                                        0       0.0
    SSE                                                        0       0.0
      S                                                        0       0.0
    SSW                                                        0       0.0
     SW                                                        0       0.0
    WSW             8.3                                        1       8.3      4.1
      W                   33.3   16.6                          6      49.9      9.8
    WNW      8.3          16.6                                 3      24.9      6.1
     NW                    8.3                                 1       8.3      7.7
    NNW                                                        0       0.0

   CALM                                                        0       0.0

L. TOTALS    8.3    8.3   66.5   16.6                         12                8.0
```

```
                FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

     LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

     750 METER LEVEL WINDS MORNING     DECEMBER,1978

      DIRECTION   ********* WIND SPEEDS METERS/SECOND ************************
                   00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                    TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
                   02.9   05.9   09.9   15.9   25.0   25.0      COUNT  PERCENT  SPEED

             N             6.2                                     1      6.2     5.8
           NNE                    6.2                              1      6.2     8.1
            NE                                                     0      0.0
           ENE     6.2                                             1      6.2     2.1
             E                                                     0      0.0
           ESE                                                     0      0.0
            SE                                                     0      0.0
           SSE                                                     0      0.0
             S                                                     0      0.0
           SSW                                                     0      0.0
            SW     6.2                                             1      6.2     2.8
           WSW             6.2    6.2                              2     12.4     6.2
             W                           6.2   12.5                3     18.7    17.5
           WNW     6.2     6.2   12.5    6.2                       5     31.1     7.8
            NW    12.5                                             2     12.5     2.3
           NNW                                                     0      0.0

          CALM                                                     0      0.0

     COL. TOTALS  31.1    18.6   24.9   12.4   12.5               16              7.9

      750 METER LEVEL WINDS AFTERNOON  DECEMBER,1978

      DIRECTION   ********* WIND SPEEDS METERS/SECOND ************************
                   00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                    TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
                   02.9   05.9   09.9   15.9   25.0   25.0      COUNT  PERCENT  SPEED

             N                                                     0      0.0
           NNE                                                     0      0.0
            NE                                                     0      0.0
           ENE                                                     0      0.0
             E                                                     0      0.0
           ESE                                                     0      0.0
            SE                                                     0      0.0
           SSE                                                     0      0.0
             S                                                     0      0.0
           SSW                                                     0      0.0
            SW                                                     0      0.0
           WSW             9.0                                     1      9.0     3.4
             W             9.0   27.2   36.2                       8     72.5    10.4
           WNW                    9.0    9.0                       2     18.0    11.6
            NW                                                     0      0.0
           NNW                                                     0      0.0

          CALM                                                     0      0.0

     COL. TOTALS          18.0   36.2   45.3                      11             10.0
```

```
             FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
00 METER LEVEL WINDS MORNING     DECEMBER,1978
DIRECTION   ********* WIND SPEEDS METERS/SECOND *****************************
            00.1  03.0  06.0  10.0  16.0  GREATER     ROW   SUMMARY
             TO    TO    TO    TO    TO    THAN     TOTAL   TOTAL   AVERAGE
            02.9  05.9  09.9  15.9  25.0   25.0     COUNT  PERCENT  SPEED

    N             7.1                                 1      7.1      5.7
  NNE                                                 0      0.0
   NE                   7.1                           1      7.1      8.9
  ENE                                                 0      0.0
    E                                                 0      0.0
  ESE                                                 0      0.0
   SE                                                 0      0.0
  SSE                                                 0      0.0
    S             7.1                                 1      7.1      3.0
  SSW                                                 0      0.0
   SW                                                 0      0.0
  WSW                   7.1                           1      7.1      6.4
    W                   7.1   7.1   21.4   14.2       7     49.8     30.3
  WNW                   7.1   7.1                     2     14.2      9.9
   NW             7.1                                 1      7.1      3.2
  NNW                                                 0      0.0

 CALM                                                 0      0.0

L. TOTALS         21.3  28.4  14.2  21.4   14.2      14              18.7
00 METER LEVEL WINDS AFTERNOON  DECEMBER,1978
DIRECTION   ********* WIND SPEEDS METERS/SECOND *****************************
            00.1  03.0  06.0  10.0  16.0  GREATER     ROW   SUMMARY
             TO    TO    TO    TO    TO    THAN     TOTAL   TOTAL   AVERAGE
            02.9  05.9  09.9  15.9  25.0   25.0     COUNT  PERCENT  SPEED

    N                                                 0      0.0
  NNE                                                 0      0.0
   NE                                                 0      0.0
  ENE                                                 0      0.0
    E                                                 0      0.0
  ESE                                                 0      0.0
   SE                                                 0      0.0
  SSE                                                 0      0.0
    S                                                 0      0.0
  SSW                                                 0      0.0
   SW                                                 0      0.0
  WSW                                                 0      0.0
    W                  11.1  44.4          11.1       6     66.6     17.0
  WNW                  33.3                           3     33.3      6.8
   NW                                                 0      0.0
  NNW                                                 0      0.0

 CALM                                                 0      0.0

L. TOTALS              44.4  44.4          11.1       9              13.6
```

# FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

1500 METER LEVEL WINDS MORNING DECEMBER,1978

| DIRECTION | ********* WIND SPEEDS METERS/SECOND ************************** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
| N | | | 10.0 | | | | 1 | 10.0 | 6.3 |
| NNE | | | | | | | 0 | 0.0 | |
| NE | | | | 10.0 | | | 1 | 10.0 | 13.0 |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | | | | | | 0 | 0.0 | |
| SSW | | | | | | | 0 | 0.0 | |
| SW | | | | | | | 0 | 0.0 | |
| WSW | | | | | | | 0 | 0.0 | |
| W | | | | 30.0 | 10.0 | 20.0 | 6 | 60.0 | 22.6 |
| WNW | | | | 10.0 | | | 1 | 10.0 | 14.7 |
| NW | | | 10.0 | | | | 1 | 10.0 | 8.3 |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | | | 20.0 | 50.0 | 10.0 | 20.0 | 10 | | 17.8 |

1500 METER LEVEL WINDS AFTERNOON DECEMBER,1978

| DIRECTION | ********* WIND SPEEDS METERS/SECOND ************************** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
| N | | | | | | | 0 | 0.0 | |
| NNE | | | | | | | 0 | 0.0 | |
| NE | | | | | | | 0 | 0.0 | |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | | | | | | 0 | 0.0 | |
| SSW | | | | | | | 0 | 0.0 | |
| SW | | | | | | | 0 | 0.0 | |
| WSW | | | | | | | 0 | 0.0 | |
| W | | | | 14.2 | 14.2 | | 2 | 28.4 | 17.4 |
| WNW | | | 14.2 | 28.5 | | | 3 | 42.7 | 10.4 |
| NW | | | 14.2 | | | | 1 | 14.2 | 6.7 |
| NNW | | 14.2 | | | | | 1 | 14.2 | 3.0 |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | | 14.2 | 28.4 | 42.7 | 14.2 | | 7 | | 10.8 |

```
              FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

00 METER LEVEL WINDS MORNING     DECEMBER,1978

DIRECTION   ********* WIND SPEEDS METERS/SECOND ******************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

     N                                                        0      0.0
   NNE                            16.6                        1     16.6      12.7
    NE                            16.6                        1     16.6      14.3
   ENE                                                        0      0.0
     E                                                        0      0.0
   ESE                                                        0      0.0
    SE                                                        0      0.0
   SSE                                                        0      0.0
     S                                                        0      0.0
   SSW                                                        0      0.0
    SW                                                        0      0.0
   WSW                                                        0      0.0
     W                                   33.3     33.3        4     66.6      25.2
   WNW                                                        0      0.0
    NW                                                        0      0.0
   NNW                                                        0      0.0

  CALM                                                        0      0.0

L. TOTALS                         33.3   33.3     33.3        6               21.3

00 METER LEVEL WINDS AFTERNOON   DECEMBER,1978

DIRECTION   ********* WIND SPEEDS METERS/SECOND ******************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

     N                                                        0      0.0
   NNE                                                        0      0.0
    NE                                                        0      0.0
   ENE                                                        0      0.0
     E                                                        0      0.0
   ESE                                                        0      0.0
    SE                                                        0      0.0
   SSE                                                        0      0.0
     S                                                        0      0.0
   SSW                                                        0      0.0
    SW                                                        0      0.0
   WSW                                                        0      0.0
     W       33.3                                             1     33.3      [illegible]
   WNW                                   33.3                 1     33.3      [illegible]
    NW              33.3                                      1     33.3       4.4
   NNW                                                        0      0.0

  CALM                                                        0      0.0

L. TOTALS    33.3   33.3                 33.3                 3               [illegible]
```

```
            FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
2500 METER LEVEL WINDS MORNING     DECEMBER,1978
  DIRECTION   ******** WIND SPEEDS METERS/SECOND ******************************
               00.1   03.0   06.0   10.0   16.0  GREATER      ROW   SUMMARY
                TO     TO     TO     TO     TO    THAN      TOTAL    TOTAL  AVERAGE
               02.9   05.9   09.9   15.9   25.0   25.0      COUNT  PERCENT  SPEED

          N                                                   0       0.0
        NNE                                                   0       0.0
         NE                                                   0       0.0
        ENE                                                   0       0.0
          E                                                   0       0.0
        ESE                                                   0       0.0
         SE                                                   0       0.0
        SSE                                                   0       0.0
          S                                                   0       0.0
        SSW                                                   0       0.0
         SW                                                   0       0.0
        WSW                                                   0       0.0
          W                                                   0       0.0
        WNW                                                   0       0.0
         NW                                                   0       0.0
        NNW                                                   0       0.0

       CALM                                                   0       0.0

COL. TOTALS                                                   0
2500 METER LEVEL WINDS AFTERNOON  DECEMBER,1978
  DIRECTION   ******** WIND SPEEDS METERS/SECOND ******************************
               00.1   03.0   06.0   10.0   16.0  GREATER      ROW   SUMMARY
                TO     TO     TO     TO     TO    THAN      TOTAL    TOTAL  AVERAGE
               02.9   05.9   09.9   15.9   25.0   25.0      COUNT  PERCENT  SPEED

          N                                                   0       0.0
        NNE                                                   0       0.0
         NE                                                   0       0.0
        ENE                                                   0       0.0
          E                                                   0       0.0
        ESE                                                   0       0.0
         SE                                                   0       0.0
        SSE                                                   0       0.0
          S                                                   0       0.0
        SSW                                                   0       0.0
         SW                                                   0       0.0
        WSW                                                   0       0.0
          W                                                   0       0.0
        WNW                                                   0       0.0
         NW                                                   0       0.0
        NNW                                                   0       0.0

       CALM                                                   0       0.0

COL. TOTALS                                                   0
```

```
                       FREQUENCY SUMMARY OF INVERSIONS (PERCENTAGES)

 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

                         MONTH OF  DECEMBER 1978    MORNING

            **************** INVERSION BASE HEIGHT (METERS) ****************
            SFC     001     101     251     501     751    1001    1501    2001    2501      >
CKNESS               TO      TO      TO      TO      TO      TO      TO      TO      TO    THAN      TOTAL
ETERS)              100     250     500     750    1000    1500    2000    2500    3000    3000

-100       16.6     2.0     4.1     8.3     2.0     8.3     6.2     2.0                              49.5

-250        8.3             2.0    10.4     2.0     4.1     6.2     2.0             2.0              37.0

-500        2.0                             4.1     2.0     4.1                                      12.2

-750

AL         26.9     2.0     6.1    18.7     8.1    14.4    16.5     4.0             2.0

 INVERSION                                                                                            0.0

                                                                 TOTAL NO. OF OCCURENCES               48

IVERSION
 TYPE

1           2.0     2.0     4.1     8.3     4.1     6.2    14.5     2.0                              43.2

2           8.3             2.0    10.4             6.2     2.0                     2.0              30.9

3          12.5                             4.1     2.0             2.0                              20.6

4           2.0                                                                                       2.0

5           2.0                                                                                       2.0

                         MONTH OF  DECEMBER 1978    AFTERNOON

            **************** INVERSION BASE HEIGHT (METERS) ****************
            SFC     001     101     251     501     751    1001    1501    2001    2501      >
CKNESS               TO      TO      TO      TO      TO      TO      TO      TO      TO    THAN      TOTAL
ETERS)              100     250     500     750    1000    1500    2000    2500    3000    3000

-100       12.0             4.0    16.0     8.0     4.0     4.0     8.0     4.0                      60.0

-250                4.0    12.0     4.0                     8.0                                      28.0

-500                                                                4.0             4.0               8.0

-750

AL         12.0     4.0    16.0    20.0     8.0     4.0    12.0    12.0     4.0     4.0

 INVERSION                                                                                            4.0

                                                                 TOTAL NO. OF OCCURENCES               24

VERSION
 TYPE

1                           8.3    16.6     8.3            12.5     4.1             4.1              53.9

2          12.5             4.1     4.1             4.1             8.3     4.1                      37.2

3                   4.1     4.1                                                                       8.2

4

5
```

```
                FREQUENCY SUMMARY OF MIXING HEIGHTS

     LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

    MIXING HEIGHTS -FREQUENCY OF OCCURENCE FOR  DECEMBER  1978

  MIXING HEIGHT          MORNING             AFTERNOON
   (METERS)            OCCURENCES           OCCURENCES

        0- 100               4                    0

      101- 250               5                    1

      251- 500               4                    7

      501- 750               1                    0

      751-1000               2                    0

     1001-1500               2                    1

         >1500               0                    3

         TOTAL              18                   12

   AVERAGE WIND SPEED
   THROUGH MIXED
   LAYER (M/SEC)           8.7                  7.3

   AVERAGE LAPSE RATE
   BELOW FIRST INVER.
      (DEG C /100M)   -00.65               -01.17
```

```
            FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
CATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
      SURFACE WINDS MORNING      JANUARY,1979
IRECTION   ********* WIND SPEEDS METERS/SECOND **************************
            00.1  03.0  06.0  10.0  16.0  GREATER     ROW  SUMMARY
             TO    TO    TO    TO    TO     THAN    TOTAL   TOTAL  AVERAGE
            02.9  05.9  09.9  15.9  25.0    25.0    COUNT  PERCENT  SPEED

   N        17.6                                        3    17.6      .8
 NNE                                                    0     0.0
  NE                                                    0     0.0
 ENE                                                    0     0.0
   E                                                    0     0.0
 ESE         5.8                                        1     5.8      .9
  SE                                                    0     0.0
 SSE                                                    0     0.0
   S         5.8                                        1     5.8      .9
 SSW                                                    0     0.0
  SW         5.8   5.8                                  2    11.6     2.2
 WSW         5.8                                        1     5.8     1.3
   W        17.6                                        3    17.6     1.9
 WNW                                                    0     0.0
  NW                                                    0     0.0
 NNW         5.8                                        1     5.8      .9

CALM                                                    5    29.0

. TOTALS    64.2   5.8                                 17              .9
      SURFACE WINDS AFTERNOON    JANUARY,1979
IRECTION   ********* WIND SPEEDS METERS/SECOND **************************
            00.1  03.0  06.0  10.0  16.0  GREATER     ROW  SUMMARY
             TO    TO    TO    TO    TO     THAN    TOTAL   TOTAL  AVERAGE
            02.9  05.9  09.9  15.9  25.0    25.0    COUNT  PERCENT  SPEED

   N         5.8                                        1     5.8      .4
 NNE         5.8                                        1     5.8     1.8
  NE                                                    0     0.0
 ENE        17.6                                        3    17.6      .5
   E        11.7                                        2    11.7      .6
 ESE         5.8                                        1     5.8      .4
  SE         5.8                                        1     5.8      .2
 SSE         5.8   5.8                                  2    11.6     2.3
   S                                                    0     0.0
 SSW         5.8         5.8                            2    11.6     5.3
  SW         5.8                                        1     5.8      .2
 WSW                                                    0     0.0
   W         5.8                                        1     5.8      .4
 WNW         5.8                                        1     5.8      .4
  NW         5.8                                        1     5.8      .4
 NNW                                                    0     0.0

CALM                                                    0     0.0

. TOTALS    87.3   5.8   5.8                           17             1.3
```

## FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

100 METER LEVEL WINDS MORNING JANUARY,1979

********* WIND SPEEDS METERS/SECOND ***************************

| DIRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| N | 5.8 | | | | | | 1 | 5.8 | .5 |
| NNE | 5.8 | | | | | | 1 | 5.8 | 2.6 |
| NE | 5.8 | | | | | | 1 | 5.8 | 2.7 |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | 5.8 | | | | | | 1 | 5.8 | 1.0 |
| SSE | | | | | | | 0 | 0.0 | |
| S | 5.8 | | | | | | 1 | 5.8 | .9 |
| SSW | | 5.8 | | | | | 1 | 5.8 | 3.6 |
| SW | 11.7 | 5.8 | | | | | 3 | 17.5 | 2.2 |
| WSW | 5.8 | 11.7 | | | | | 3 | 17.5 | 3.7 |
| W | 5.8 | | | | | | 1 | 5.8 | 2.8 |
| WNW | 5.8 | | | | | | 1 | 5.8 | 1.1 |
| NW | 5.8 | | | | | | 1 | 5.8 | .7 |
| NNW | 11.7 | | | | | | 2 | 11.7 | 1.0 |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 75.6 | 23.3 | | | | | 17 | | 2.1 |

100 METER LEVEL WINDS AFTERNOON JANUARY,1979

********* WIND SPEEDS METERS/SECOND ***************************

| DIRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| N | | | | | | | 0 | 0.0 | |
| NNE | 11.7 | | | | | | 2 | 11.7 | 1.9 |
| NE | | | | | | | 0 | 0.0 | |
| ENE | 5.8 | | | | | | 1 | 5.8 | .9 |
| E | | | | | | | 0 | 0.0 | |
| ESE | 11.7 | | | | | | 2 | 11.7 | 1.4 |
| SE | 11.7 | | | | | | 2 | 11.7 | .5 |
| SSE | | | | | | | 0 | 0.0 | |
| S | 5.8 | | 5.8 | | | | 2 | 11.6 | 3.8 |
| SSW | | | | | 5.8 | | 1 | 5.8 | 17.0 |
| SW | | 5.8 | | | | | 1 | 5.8 | 5.6 |
| WSW | 5.8 | | | | | | 1 | 5.8 | 1.1 |
| W | | | | | | | 0 | 0.0 | |
| WNW | 5.8 | 5.8 | | | | | 2 | 11.6 | 2.2 |
| NW | | | | | | | 0 | 0.0 | |
| NNW | 17.6 | | | | | | 3 | 17.6 | 1.6 |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 75.9 | 11.6 | 5.8 | | 5.8 | | 17 | | 2.8 |

```
          FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
00 METER LEVEL WINDS MORNING       JANUARY,1979

DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
             00.1  03.0  06.0  10.0  16.0  GREATER      ROW  SUMMARY
              TO    TO    TO    TO    TO     THAN     TOTAL   TOTAL  AVERAGE
             02.9  05.9  09.9  15.9  25.0    25.0     COUNT  PERCENT  SPEED

     N       23.5        5.8                            5      29.3      2.4
   NNE        5.8                                       1       5.8      2.6
    NE                                                  0       0.0
   ENE                                                  0       0.0
     E                                                  0       0.0
   ESE                                                  0       0.0
    SE                                                  0       0.0
   SSE        5.8  11.7                                 3      17.5      3.5
     S             11.7                                 2      11.7      3.0
   SSW                                                  0       0.0
    SW        5.8        5.8                            2      11.6      5.1
   WSW              5.8                                 1       5.8      5.0
     W        5.8   5.8                                 2      11.6      3.6
   WNW              5.8                                 1       5.8      5.3
    NW                                                  0       0.0
   NNW                                                  0       0.0

 CALM                                                   0       0.0

L. TOTALS    46.7  40.8  11.6                          17                3.4

00 METER LEVEL WINDS AFTERNOON     JANUARY,1979

DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
             00.1  03.0  06.0  10.0  16.0  GREATER      ROW  SUMMARY
              TO    TO    TO    TO    TO     THAN     TOTAL   TOTAL  AVERAGE
             02.9  05.9  09.9  15.9  25.0    25.0     COUNT  PERCENT  SPEED

     N              5.8                                 1       5.8      5.7
   NNE             23.5                                 4      23.5      3.3
    NE       11.7                                       2      11.7      1.2
   ENE                                                  0       0.0
     E                                                  0       0.0
   ESE                                                  0       0.0
    SE                                                  0       0.0
   SSE                                                  0       0.0
     S       17.6        5.8                            4      23.4      3.0
   SSW              5.8  5.8                            2      11.6      6.4
    SW              5.8                                 1       5.8      3.6
   WSW                                                  0       0.0
     W                                                  0       0.0
   WNW                   5.8                            1       5.8      7.6
    NW        5.8                                       1       5.8       .5
   NNW        5.8                                       1       5.8      2.6

 CALM                                                   0       0.0

L. TOTALS    40.9  40.9  17.4                          17                3.5
```

```
                FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
300 METER LEVEL WINDS MORNING      JANUARY,1979

 DIRECTION  ********* WIND SPEEDS METERS/SECOND *****************************
            00.1  03.0  06.0  10.0  16.0  GREATER      ROW   SUMMARY
             TO    TO    TO    TO    TO    THAN     TOTAL    TOTAL  AVERAGE
            02.9  05.9  09.9  15.9  25.0   25.0     COUNT  PERCENT    SPEED

        N   11.7                                        2     11.7     1.1
      NNE                5.8                            1      5.8     6.7
       NE                                               0      0.0
      ENE                                               0      0.0
        E                                               0      0.0
      ESE                                               0      0.0
       SE                                               0      0.0
      SSE         11.7  11.7                            4     23.4     5.3
        S   11.7         5.8                            3     17.5     3.0
      SSW    5.8               5.8                      2     11.6     6.4
       SW          5.8                                  1      5.8     4.6
      WSW    5.8                                        1      5.8     1.0
        W                5.8                            1      5.8     6.4
      WNW                5.8                            1      5.8     6.6
       NW                                               0      0.0
      NNW    5.8                                        1      5.8     2.0

     CALM                                               0      0.0

COL. TOTALS 40.8  17.5  34.9   5.8                     17              4.2

300 METER LEVEL WINDS AFTERNOON    JANUARY,1979

 DIRECTION  ********* WIND SPEEDS METERS/SECOND *****************************
            00.1  03.0  06.0  10.0  16.0  GREATER      ROW   SUMMARY
             TO    TO    TO    TO    TO    THAN     TOTAL    TOTAL  AVERAGE
            02.9  05.9  09.9  15.9  25.0   25.0     COUNT  PERCENT    SPEED

        N   11.7        11.7                            4     23.4     4.2
      NNE         17.6                                  3     17.6     4.6
       NE          5.8                                  1      5.8     4.3
      ENE                                               0      0.0
        E                                               0      0.0
      ESE                                               0      0.0
       SE    5.8         5.8                            2     11.6     4.5
      SSE                                               0      0.0
        S                                               0      0.0
      SSW          5.8                                  1      5.8     4.9
       SW          5.8                     5.8          2     11.6    10.1
      WSW    5.8                                        1      5.8     2.8
        W                                               0      0.0
      WNW                5.8                            1      5.8     7.7
       NW                5.8                            1      5.8     8.3
      NNW                5.8                            1      5.8     6.3

     CALM                                               0      0.0

COL. TOTALS 23.3  35.0  34.9               5.8         17              5.5
```

```
                    FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
CATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
0 METER LEVEL WINDS MORNING       JANUARY,1979
IRECTION     ********* WIND SPEEDS METERS/SECOND **************************
                00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                 TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
                02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

     N                 5.8                                       1       5.8      3.1
   NNE                 5.8    5.8                                2      11.6      5.7
    NE                                                           0       0.0
   ENE                                                           0       0.0
     E                                                           0       0.0
   ESE                                                           0       0.0
    SE                                                           0       0.0
   SSE                                                           0       0.0
     S          5.8                                              1       5.8      2.1
   SSW                 5.8   17.6    5.8                         5      29.2      8.7
    SW                                                           0       0.0
   WSW          5.8    5.8                                       2      11.6      3.0
     W                        5.8                                1       5.8      8.1
   WNW          5.8    5.8   11.7                                4      23.3      5.2
    NW          5.8                                              1       5.8      1.7
   NNW                                                           0       0.0

CALM                                                             0       0.0

. TOTALS       23.2   29.0   40.9    5.8                        17                5.7
0 METER LEVEL WINDS AFTERNOON     JANUARY,1979
IRECTION     ********* WIND SPEEDS METERS/SECOND **************************
                00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                 TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
                02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

     N                       12.5                                2      12.5      9.6
   NNE                 6.2                                       1       6.2      3.5
    NE                        6.2                                1       6.2      6.3
   ENE                                                           0       0.0
     E                 6.2                                       1       6.2      3.0
   ESE                                                           0       0.0
    SE                                                           0       0.0
   SSE                 6.2                                       1       6.2      4.6
     S                12.5                                       2      12.5      5.3
   SSW          6.2                                              1       6.2      2.4
    SW          6.2                                              1       6.2      2.0
   WSW                                                           0       0.0
     W                       18.7                                3      18.7      7.2
   WNW          6.2    6.2                                       2      12.4      2.2
    NW                                                           0       0.0
   NNW                 6.2                                       1       6.2      3.6

CALM                                                             0       0.0

. TOTALS       18.6   43.5   37.4                               16                5.0
```

```
          FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
 750 METER LEVEL WINDS MORNING      JANUARY,1979
  DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
               00.1  03.0  06.0  10.0  16.0  GREATER      ROW  SUMMARY
                TO    TO    TO    TO    TO    THAN      TOTAL   TOTAL  AVERAGE
               02.9  05.9  09.9  15.9  25.0   25.0      COUNT  PERCENT  SPEED

        N      6.6                                          1     6.6     1.9
      NNE            6.6   6.6                              2    13.2     5.6
       NE            6.6                                    1     6.6     5.0
      ENE                                                   0     0.0
        E                                                   0     0.0
      ESE                                                   0     0.0
       SE                                                   0     0.0
      SSE                                                   0     0.0
        S      6.6                                          1     6.6     1.4
      SSW                                                   0     0.0
       SW                        6.6                        1     6.6    12.3
      WSW                  6.6                              1     6.6     6.0
        W      6.6   6.6  20.0                              5    33.2     5.6
      WNW                 13.3         6.6                  3    19.9    10.7
       NW                                                   0     0.0
      NNW                                                   0     0.0

     CALM                                                   0     0.0

 COL. TOTALS  19.8  19.8  46.5   6.6   6.6                 15             6.5
 750 METER LEVEL WINDS AFTERNOON    JANUARY,1979

  DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
               00.1  03.0  06.0  10.0  16.0  GREATER      ROW  SUMMARY
                TO    TO    TO    TO    TO    THAN      TOTAL   TOTAL  AVERAGE
               02.9  05.9  09.9  15.9  25.0   25.0      COUNT  PERCENT  SPEED

        N            6.6                                    1     6.6     4.8
      NNE                                                   0     0.0
       NE            6.6                                    1     6.6     5.0
      ENE      6.6   6.6                                    2    13.2     2.5
        E                                                   0     0.0
      ESE                                                   0     0.0
       SE      6.6                                          1     6.6     2.0
      SSE                                                   0     0.0
        S                                                   0     0.0
      SSW                                                   0     0.0
       SW                  6.6                              1     6.6     6.9
      WSW            6.6                                    1     6.6     4.9
        W      6.6  13.3  13.3   6.6                        6    39.8     6.8
      WNW                  6.6                              1     6.6     7.3
       NW                                                   0     0.0
      NNW      6.6                                          1     6.6     1.4

     CALM                                                   0     0.0

 COL. TOTALS  26.4  39.7  26.5   6.6                       15             5.2
```

```
                 FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
00 METER LEVEL WINDS MORNING       JANUARY,1979
DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

     N                                                        0      0.0
   NNE              7.6                                       1      7.6      3.0
    NE              7.6                                       1      7.6      5.8
   ENE       7.6                                              1      7.6      2.3
     E                                                        0      0.0
   ESE                                                        0      0.0
    SE                                                        0      0.0
   SSE                                                        0      0.0
     S                                                        0      0.0
   SSW                                                        0      0.0
    SW              7.6                                       1      7.6      4.4
   WSW                                                        0      0.0
     W                     15.3   15.3                        4     30.6     10.4
   WNW                     15.3          7.6                  3     22.9     10.8
    NW                      7.6                               1      7.6      8.9
   NNW       7.6                                              1      7.6       .8

 CALM                                                         0      0.0

L. TOTALS    15.2   22.8   38.2   15.3   7.6                 13               7.6
00 METER LEVEL WINDS AFTERNOON     JANUARY,1979
DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

     N                                                        0      0.0
   NNE       8.3                                              1      8.3      2.1
    NE                                                        0      0.0
   ENE                                                        0      0.0
     E       8.3                                              1      8.3      2.0
   ESE                                                        0      0.0
    SE                                                        0      0.0
   SSE       8.3                                              1      8.3      1.5
     S                                                        0      0.0
   SSW              8.3                                       1      8.3      3.4
    SW                      8.3                               1      8.3      6.7
   WSW                      8.3                               1      8.3      6.4
     W                      8.3    8.3                        2     16.6      9.0
   WNW                     16.6    8.3                        3     24.9      9.4
    NW                                                        0      0.0
   NNW       8.3                                              1      8.3      1.9

 CALM                                                         0      0.0

L. TOTALS    33.2    8.3   41.5   16.6                       12               5.8
```

```
                FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
1500 METER LEVEL WINDS MORNING       JANUARY,1979

  DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
               00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
                TO     TO     TO     TO     TO     THAN       TOTAL    TOTAL   AVERAGE
               02.9   05.9   09.9   15.9   25.0    25.0       COUNT   PERCENT   SPEED

          N           11.1                                       1     11.1      4.7
        NNE                                                      0      0.0
         NE                                                      0      0.0
        ENE    11.1   11.1                                       2     22.2      3.4
          E                                                      0      0.0
        ESE                                                      0      0.0
         SE                                                      0      0.0
        SSE                                                      0      0.0
          S                                                      0      0.0
        SSW                                                      0      0.0
         SW                                                      0      0.0
        WSW           11.1   11.1                                2     22.2      5.7
          W                         11.1                         1     11.1     12.3
        WNW                         11.1                         1     11.1     10.1
         NW                         11.1                         1     11.1     11.3
        NNW                         11.1                         1     11.1     13.0

       CALM                                                      0      0.0

COL. TOTALS    11.1   33.3   11.1   44.4                         9               7.7
1500 METER LEVEL WINDS AFTERNOON     JANUARY,1979

  DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
               00.1   03.0   06.0   10.0   16.0   GREATER       ROW   SUMMARY
                TO     TO     TO     TO     TO     THAN       TOTAL    TOTAL   AVERAGE
               02.9   05.9   09.9   15.9   25.0    25.0       COUNT   PERCENT   SPEED

          N                                                      0      0.0
        NNE                                                      0      0.0
         NE    11.1                                              1     11.1      2.1
        ENE                                                      0      0.0
          E                                                      0      0.0
        ESE                                                      0      0.0
         SE                                                      0      0.0
        SSE                                                      0      0.0
          S                  11.1                                1     11.1      7.2
        SSW                                                      0      0.0
         SW                                                      0      0.0
        WSW    11.1                                              1     11.1      2.2
          W                  11.1   11.1                         2     22.2      9.0
        WNW                  22.2                                2     22.2      9.5
         NW           11.1          11.1                         2     22.2      8.2
        NNW                                                      0      0.0

       CALM                                                      0      0.0

COL. TOTALS    22.2   11.1   44.4   22.2                         9               7.2
```

```
             FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
00 METER LEVEL WINDS MORNING     JANUARY,1979
DIRECTION  ********* WIND SPEEDS METERS/SECOND *************************
            00.1  03.0  06.0  10.0  16.0  GREATER    ROW  SUMMARY
             TO    TO    TO    TO    TO    THAN    TOTAL  TOTAL  AVERAGE
            02.9  05.9  09.9  15.9  25.0   25.0    COUNT PERCENT   SPEED

    N                                                  0    0.0
  NNE                                                  0    0.0
   NE                                                  0    0.0
  ENE                                                  0    0.0
    E                                                  0    0.0
  ESE                                                  0    0.0
   SE                                                  0    0.0
  SSE                                                  0    0.0
    S                                                  0    0.0
  SSW                                                  0    0.0
   SW                                                  0    0.0
  WSW                               33.3               1   33.3     16.6
    W                         33.3                     1   33.3     12.8
  WNW                   33.3                           1   33.3      8.1
   NW                                                  0    0.0
  NNW                                                  0    0.0

 CALM                                                  0    0.0

L. TOTALS               33.3  33.3  33.3               3            12.5
00 METER LEVEL WINDS AFTERNOON   JANUARY,1979
DIRECTION  ********* WIND SPEEDS METERS/SECOND *************************
            00.1  03.0  06.0  10.0  16.0  GREATER    ROW  SUMMARY
             TO    TO    TO    TO    TO    THAN    TOTAL  TOTAL  AVERAGE
            02.9  05.9  09.9  15.9  25.0   25.0    COUNT PERCENT   SPEED

    N       12.5  12.5                                 2   25.0      3.4
  NNE                                                  0    0.0
   NE                                                  0    0.0
  ENE                                                  0    0.0
    E             12.5                                 1   12.5      3.9
  ESE                                                  0    0.0
   SE                   12.5                           1   12.5      6.9
  SSE                                                  0    0.0
    S                                                  0    0.0
  SSW                                                  0    0.0
   SW                                                  0    0.0
  WSW                                                  0    0.0
    W                   12.5                           1   12.5      6.0
  WNW             12.5        12.5                     2   25.0      8.3
   NW                               12.5               1   12.5     21.5
  NNW                                                  0    0.0

 CALM                                                  0    0.0

L. TOTALS   12.5  37.5  25.0  12.5  12.5               8             7.7
```

```
           FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
2500 METER LEVEL WINDS MORNING       JANUARY,1979
  DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
               00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                TO     TO     TO     TO     TO     THAN      TOTAL    TOTAL  AVERAG
               02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

         N                                                     0        0.0
       NNE                                                     0        0.0
        NE                                                     0        0.0
       ENE                                                     0        0.0
         E                                                     0        0.0
       ESE                                                     0        0.0
        SE                                                     0        0.0
       SSE                                                     0        0.0
         S                                                     0        0.0
       SSW                                                     0        0.0
        SW                                                     0        0.0
       WSW                                                     0        0.0
         W                                                     0        0.0
       WNW                                                     0        0.0
        NW                                                     0        0.0
       NNW                                                     0        0.0

   CALM                                                        0        0.0

COL. TOTALS                                                    0
2500 METER LEVEL WINDS AFTERNOON     JANUARY,1979
  DIRECTION   ********* WIND SPEEDS METERS/SECOND **************************
               00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                TO     TO     TO     TO     TO     THAN      TOTAL    TOTAL  AVERAG
               02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

         N                                                     0        0.0
       NNE                                                     0        0.0
        NE                                                     0        0.0
       ENE                                                     0        0.0
         E                                                     0        0.0
       ESE                                                     0        0.0
        SE                                                     0        0.0
       SSE                                                     0        0.0
         S                                                     0        0.0
       SSW                                                     0        0.0
        SW                                                     0        0.0
       WSW                                                     0        0.0
         W                                                     0        0.0
       WNW                                                     0        0.0
        NW                                                     0        0.0
       NNW                                                     0        0.0

   CALM                                                        0        0.0

COL. TOTALS                                                    0
```

```
              FREQUENCY SUMMARY OF INVERSIONS (PERCENTAGES)
LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
               MONTH OF   JANUARY 1979    MORNING

       **************** INVERSION BASE HEIGHT (METERS) ***************
       SFC   001   101   251   501   751  1001  1501  2001  2501   >
KNESS        TO    TO    TO    TO    TO    TO    TO    TO    TO   THAN   TOTAL
TERS)        100   250   500   750  1000  1500  2000  2500  3000  3000

100    1.5   3.1   1.5   6.3  14.2   4.7   4.7   6.3                      42.3

250    9.5         1.5   7.9   1.5   1.5   9.5   6.3                      37.7

500    4.7   1.5   3.1   3.1               1.5   3.1                      17.0

750          1.5                                                           1.5

L     15.7   6.1   6.1  17.3  15.7   6.2  15.7  15.7

INVERSION                                                                  0.0

                                                TOTAL NO. OF OCCURENCES     63

ERSION
YPE

       1.5   1.5         6.3   7.9   1.5  11.1   7.9                      37.7

       3.1   1.5   1.5   6.3   4.7   3.1   3.1   7.9                      31.2

       9.5   3.1   4.7   3.1   3.1   1.5   1.5                            26.5

       1.5               1.5                                               3.0


               MONTH OF   JANUARY 1979    AFTERNOON

       **************** INVERSION BASE HEIGHT (METERS) ***************
       SFC   001   101   251   501   751  1001  1501  2001  2501   >
KNESS        TO    TO    TO    TO    TO    TO    TO    TO    TO   THAN   TOTAL
TERS)        100   250   500   750  1000  1500  2000  2500  3000  3000

100    3.2         6.5   4.9   3.2   6.5   3.2   8.1                      35.6

250          3.2   8.1  18.0   9.8   1.6   3.2   8.1                      52.0

500                3.2               3.2   4.9                            11.3

750

L      3.2   3.2  17.8  22.9  13.0  11.3  11.3  16.2

INVERSION                                                                  0.0

                                                TOTAL NO. OF OCCURENCES     61

ERSION
YPE

                   4.9   4.9   6.5   4.9         8.1                      29.3

       1.6         3.2   9.8   4.9   4.9   9.8   8.1                      42.3

       1.6         9.8   6.1   1.6   1.6   1.6                            24.3

             3.2                                                           3.2
```

```
                 FREQUENCY SUMMARY OF MIXING HEIGHTS
    LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
   MIXING HEIGHTS -FREQUENCY OF OCCURENCE FOR   JANUARY  1979
MIXING HEIGHT        MORNING               AFTERNOON
 (METERS)          OCCURENCES             OCCURENCES

     0- 100             8                      0

   101- 250             5                      3

   251- 500             3                     10

   501- 750             0                      3

   751-1000             0                      1

  1001-1500             0                      0

      >1500             0                      0

      TOTAL            16                     17


 AVERAGE WIND SPEED
 THROUGH MIXED
 LAYER (M/SEC)        2.5                    3.7


 AVERAGE LAPSE RATE
 BELOW FIRST INVER.
    (DEG C /100M)  -01.98                 -01.56
```

FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

CATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

SURFACE WINDS MORNING FEBRUARY,1979

| IRECTION | ********* WIND SPEEDS METERS/SECOND ********* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
| N | | | | | | | 0 | 0.0 | |
| NNE | 14.2 | | | | | | 2 | 14.2 | 1.1 |
| NE | | | | | | | 0 | 0.0 | |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | 7.1 | 7.1 | | | | | 2 | 14.2 | 2.4 |
| SSW | | | 7.1 | | | | 1 | 7.1 | 6.7 |
| SW | 14.2 | | | | | | 2 | 14.2 | .6 |
| WSW | 21.4 | | | | | | 3 | 21.4 | 1.3 |
| W | 7.1 | | | | | | 1 | 7.1 | .9 |
| WNW | | | | | | | 0 | 0.0 | |
| NW | | | | | | | 0 | 0.0 | |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 3 | 21.0 | |
| . TOTALS | 64.0 | 7.1 | 7.1 | | | | 14 | | 1.4 |

SURFACE WINDS AFTERNOON FEBRUARY,1979

| IRECTION | ********* WIND SPEEDS METERS/SECOND ********* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
| N | | | | | | | 0 | 0.0 | |
| NNE | 25.0 | | | | | | 2 | 25.0 | 1.7 |
| NE | | | | | | | 0 | 0.0 | |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | 12.5 | | | | | | 1 | 12.5 | .9 |
| SSE | | | | | | | 0 | 0.0 | |
| S | | | | | | | 0 | 0.0 | |
| SSW | 12.5 | 25.0 | | | | | 3 | 37.5 | 3.9 |
| SW | | | | | | | 0 | 0.0 | |
| WSW | | 12.5 | | | | | 1 | 12.5 | 4.5 |
| W | | | | | | | 0 | 0.0 | |
| WNW | 12.5 | | | | | | 1 | 12.5 | 2.7 |
| NW | | | | | | | 0 | 0.0 | |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| . TOTALS | 62.5 | 37.5 | | | | | 8 | | 2.9 |

```
              FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
  LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
  100 METER LEVEL WINDS MORNING     FEBRUARY,1979
   DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
               00.1  03.0  06.0  10.0  16.0  GREATER      ROW   SUMMARY
                TO    TO    TO    TO    TO     THAN     TOTAL   TOTAL  AVERAGE
               02.9  05.9  09.9  15.9  25.0    25.0     COUNT  PERCENT  SPEED

         N                                                0      0.0
       NNE      7.1                                       1      7.1      1.9
        NE            7.1                                 1      7.1      4.8
       ENE                                                0      0.0
         E                                                0      0.0
       ESE                                                0      0.0
        SE                                                0      0.0
       SSE                                                0      0.0
         S                        14.2                    2     14.2     10.8
       SSW     14.2                7.1                    3     21.3      5.5
        SW     21.4   7.1                                 4     28.5      2.0
       WSW      7.1                                       1      7.1      1.8
         W                                                0      0.0
       WNW     14.2                                       2     14.2       .6
        NW                                                0      0.0
       NNW                                                0      0.0

     CALM                                                 0      0.0

 COL. TOTALS   64.0  14.2         21.3                   14               4.0
  100 METER LEVEL WINDS AFTERNOON  FEBRUARY,1979

   DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
               00.1  03.0  06.0  10.0  16.0  GREATER      ROW   SUMMARY
                TO    TO    TO    TO    TO     THAN     TOTAL   TOTAL  AVERAGE
               02.9  05.9  09.9  15.9  25.0    25.0     COUNT  PERCENT  SPEED

         N                                                0      0.0
       NNE           12.5                                 1     12.5      3.8
        NE           12.5                                 1     12.5      3.3
       ENE                                                0      0.0
         E                                                0      0.0
       ESE                                                0      0.0
        SE           12.5                                 1     12.5      5.0
       SSE                                                0      0.0
         S                                                0      0.0
       SSW                 37.5                           3     37.5      7.8
        SW                                                0      0.0
       WSW                 12.5                           1     12.5      8.0
         W                                                0      0.0
       WNW           12.5                                 1     12.5      5.5
        NW                                                0      0.0
       NNW                                                0      0.0

     CALM                                                 0      0.0

 COL. TOTALS         50.0  50.0                           8               6.1
```

```
              FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
200 METER LEVEL WINDS MORNING     FEBRUARY,1979
 DIRECTION   ********* WIND SPEEDS METERS/SECOND *************************
             00.1  03.0  06.0  10.0  16.0  GREATER      ROW  SUMMARY
              TO    TO    TO    TO    TO     THAN     TOTAL   TOTAL  AVERAGE
             02.9  05.9  09.9  15.9  25.0    25.0     COUNT  PERCENT  SPEED

     N                                                  0      0.0
   NNE             14.2                                 2     14.2       4.5
    NE                                                  0      0.0
   ENE                                                  0      0.0
     E                                                  0      0.0
   ESE                                                  0      0.0
    SE                         7.1                      1      7.1      10.3
   SSE       14.2                                       2     14.2       1.3
     S        7.1   7.1                                 2     14.2       2.5
   SSW        7.1              7.1                      2     14.2       7.4
    SW        7.1  14.2                                 3     21.3       4.1
   WSW              7.1                                 1      7.1       4.7
     W                                                  0      0.0
   WNW        7.1                                       1      7.1       2.2
    NW                                                  0      0.0
   NNW                                                  0      0.0

  CALM                                                  0      0.0

OL. TOTALS   42.6  42.6       14.2                     14                4.3
200 METER LEVEL WINDS AFTERNOON   FEBRUARY,1979
 DIRECTION   ********* WIND SPEEDS METERS/SECOND *************************
             00.1  03.0  06.0  10.0  16.0  GREATER      ROW  SUMMARY
              TO    TO    TO    TO    TO     THAN     TOTAL   TOTAL  AVERAGE
             02.9  05.9  09.9  15.9  25.0    25.0     COUNT  PERCENT  SPEED

     N                                                  0      0.0
   NNE             12.5                                 1     12.5       5.1
    NE                                                  0      0.0
   ENE                                                  0      0.0
     E       12.5                                       1     12.5       1.7
   ESE                                                  0      0.0
    SE                   12.5                           1     12.5       6.0
   SSE                                                  0      0.0
     S                                                  0      0.0
   SSW                   25.0                           2     25.0       8.4
    SW                   12.5                           1     12.5       9.0
   WSW                         12.5                     1     12.5      14.4
     W                                                  0      0.0
   WNW       12.5                                       1     12.5       2.1
    NW                                                  0      0.0
   NNW                                                  0      0.0

  CALM                                                  0      0.0

OL. TOTALS   25.0  12.5  50.0  12.5                     8                6.9
```

```
                   FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
 300 METER LEVEL WINDS MORNING     FEBRUARY,1979
  DIRECTION    ********* WIND SPEEDS METERS/SECOND ***************************
                00.1  03.0  06.0  10.0  16.0  GREATER     ROW   SUMMARY
                 TO    TO    TO    TO    TO     THAN     TOTAL   TOTAL  AVERAGE
                02.9  05.9  09.9  15.9  25.0    25.0     COUNT  PERCENT  SPEED

      N                                                    0      0.0
    NNE               7.1   7.1                            2     14.2      6.1
     NE                                                    0      0.0
    ENE         7.1                                        1      7.1       .8
      E                                                    0      0.0
    ESE                                                    0      0.0
     SE         7.1                                        1      7.1       .4
    SSE         7.1                                        1      7.1      1.3
      S        14.2   7.1                                  3     21.3      2.6
    SSW                           7.1                      1      7.1     14.2
     SW               7.1   7.1                            2     14.2      6.3
    WSW               7.1                                  1      7.1      5.1
      W               7.1                                  1      7.1      4.4
    WNW                                                    0      0.0
     NW               7.1                                  1      7.1      3.5
    NNW                                                    0      0.0

   CALM                                                    0      0.0

COL. TOTALS    35.5  42.6  14.2   7.1                     14               4.4
 300 METER LEVEL WINDS AFTERNOON  FEBRUARY,1979
  DIRECTION    ********* WIND SPEEDS METERS/SECOND ***************************
                00.1  03.0  06.0  10.0  16.0  GREATER     ROW   SUMMARY
                 TO    TO    TO    TO    TO     THAN     TOTAL   TOTAL  AVERAGE
                02.9  05.9  09.9  15.9  25.0    25.0     COUNT  PERCENT  SPEED

      N                                                    0      0.0
    NNE              12.5                                  1     12.5      3.5
     NE                                                    0      0.0
    ENE                                                    0      0.0
      E                                                    0      0.0
    ESE                                                    0      0.0
     SE              12.5                                  1     12.5      3.5
    SSE                                                    0      0.0
      S                    12.5                            1     12.5      6.1
    SSW                    12.5                            1     12.5      9.6
     SW                          12.5                      1     12.5     12.2
    WSW        12.5                                        1     12.5      2.5
      W                                12.5                1     12.5     17.0
    WNW              12.5                                  1     12.5      4.6
     NW                                                    0      0.0
    NNW                                                    0      0.0

   CALM                                                    0      0.0

COL. TOTALS    12.5  37.5  25.0  12.5  12.5                8               7.3
```

```
           FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
CATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
0 METER LEVEL WINDS MORNING      FEBRUARY,1979
IRECTION  ********* WIND SPEEDS METERS/SECOND ***************************
           00.1  03.0  06.0  10.0  16.0  GREATER     ROW   SUMMARY
            TO    TO    TO    TO    TO    THAN    TOTAL    TOTAL  AVERAGE
           02.9  05.9  09.9  15.9  25.0   25.0    COUNT   PERCENT  SPEED

   N                                                   0     0.0
 NNE              7.6                                  1     7.6     3.7
  NE                                                   0     0.0
 ENE                                                   0     0.0
   E                                                   0     0.0
 ESE                                                   0     0.0
  SE                                                   0     0.0
 SSE                    7.6                            1     7.6     6.3
   S                    7.6                            1     7.6     6.5
 SSW             23.0               7.6                4    30.6     9.4
  SW              7.6                                  1     7.6     3.6
 WSW                                                   0     0.0
   W              7.6   7.6                            2    15.2     6.6
 WNW        7.6  15.3                                  3    22.9     3.8
  NW                                                   0     0.0
 NNW                                                   0     0.0

CALM                                                   0     0.0

. TOTALS    7.6  61.1  22.8         7.6               13             6.3
0 METER LEVEL WINDS AFTERNOON  FEBRUARY,1979

IRECTION  ********* WIND SPEEDS METERS/SECOND ***************************
           00.1  03.0  06.0  10.0  16.0  GREATER     ROW   SUMMARY
            TO    TO    TO    TO    TO    THAN    TOTAL    TOTAL  AVERAGE
           02.9  05.9  09.9  15.9  25.0   25.0    COUNT   PERCENT  SPEED

   N                                                   0     0.0
 NNE                                                   0     0.0
  NE                                                   0     0.0
 ENE                                                   0     0.0
   E                                                   0     0.0
 ESE                   12.5                            1    12.5     6.2
  SE                                                   0     0.0
 SSE                                                   0     0.0
   S                                                   0     0.0
 SSW             25.0                                  2    25.0     3.6
  SW             12.5        25.0                      3    37.5     9.0
 WSW                                                   0     0.0
   W                                                   0     0.0
 WNW                                                   0     0.0
  NW       12.5                                        1    12.5     2.8
 NNW       12.5                                        1    12.5     2.2

CALM                                                   0     0.0

. TOTALS   25.0  37.5  12.5  25.0                      8             5.7
```

```
                 FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
  LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
  750 METER LEVEL WINDS MORNING     FEBRUARY,1979
   DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
                00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                 TO     TO     TO     TO     TO     THAN       TOTAL   TOTAL   AVERAGE
                02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

          N                                                      0      0.0
        NNE                                                      0      0.0
         NE                                                      0      0.0
        ENE                                                      0      0.0
          E                                                      0      0.0
        ESE                                                      0      0.0
         SE                                                      0      0.0
        SSE            7.6                                       1      7.6      3.1
          S                          7.6                         1      7.6     13.2
        SSW                   15.3                               2     15.3      9.4
         SW                                 7.6                  1      7.6     17.7
        WSW     7.6                                              1      7.6      2.9
          W     7.6   23.0     7.6   7.6                         6     45.8      6.4
        WNW                          7.6                         1      7.6     10.0
         NW                                                      0      0.0
        NNW                                                      0      0.0

       CALM                                                      0      0.0

  COL. TOTALS  15.2   30.6    22.9  22.8    7.6                 13                8.0
  750 METER LEVEL WINDS AFTERNOON  FEBRUARY,1979

   DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
                00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                 TO     TO     TO     TO     TO     THAN       TOTAL   TOTAL   AVERAGE
                02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

          N                                                      0      0.0
        NNE                                                      0      0.0
         NE                                                      0      0.0
        ENE                                                      0      0.0
          E    14.2                                              1     14.2       .9
        ESE                                                      0      0.0
         SE                                                      0      0.0
        SSE                                                      0      0.0
          S                                                      0      0.0
        SSW                                                      0      0.0
         SW           14.2    14.2  14.2                         3     42.6      8.7
        WSW           14.2                                       1     14.2      5.1
          W    14.2   14.2                                       2     28.4      3.1
        WNW                                                      0      0.0
         NW                                                      0      0.0
        NNW                                                      0      0.0

       CALM                                                      0      0.0

  COL. TOTALS  28.4   42.6    14.2  14.2                         7                5.5
```

```
            FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
00 METER LEVEL WINDS MORNING    FEBRUARY,1979
DIRECTION  ********* WIND SPEEDS METERS/SECOND ***************************
           00.1   03.0   06.0   10.0   16.0  GREATER      ROW   SUMMARY
            TO     TO     TO     TO     TO     THAN     TOTAL   TOTAL   AVERAGE
           02.9   05.9   09.9   15.9   25.0    25.0     COUNT  PERCENT   SPEED

         N                                                0      0.0
       NNE                                                0      0.0
        NE  9.0                                           1      9.0       .7
       ENE                                                0      0.0
         E                                                0      0.0
       ESE                                                0      0.0
        SE                                                0      0.0
       SSE                                                0      0.0
         S                                                0      0.0
       SSW                 9.0   18.1                     3     27.1     11.7
        SW                                      9.0       1      9.0     33.8
       WSW  9.0    9.0                                    2     18.0      2.8
         W  9.0            9.0    9.0                     3     27.0      6.9
       WNW  9.0                                           1      9.0      2.1
        NW                                                0      0.0
       NNW                                                0      0.0

      CALM                                                0      0.0

  . TOTALS 36.0    9.0   18.0   27.1            9.0      11               8.9
00 METER LEVEL WINDS AFTERNOON  FEBRUARY,1979
DIRECTION  ********* WIND SPEEDS METERS/SECOND ***************************
           00.1   03.0   06.0   10.0   16.0  GREATER      ROW   SUMMARY
            TO     TO     TO     TO     TO     THAN     TOTAL   TOTAL   AVERAGE
           02.9   05.9   09.9   15.9   25.0    25.0     COUNT  PERCENT   SPEED

         N                                                0      0.0
       NNE                                                0      0.0
        NE                                                0      0.0
       ENE                                                0      0.0
         E                                                0      0.0
       ESE                                                0      0.0
        SE        14.2                                    1     14.2      5.6
       SSE                                                0      0.0
         S                                                0      0.0
       SSW                                                0      0.0
        SW                      14.2                      1     14.2     11.8
       WSW        14.2   14.2                             2     28.4      5.8
         W        14.2                                    1     14.2      3.6
       WNW        14.2   14.2                             2     28.4      6.6
        NW                                                0      0.0
       NNW                                                0      0.0

      CALM                                                0      0.0

  . TOTALS        56.8   28.4   14.2                      7               6.5
```

```
                FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
  LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
 1500 METER LEVEL WINDS MORNING     FEBRUARY,1979
   DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
                00.1  03.0  06.0  10.0  16.0  GREATER      ROW   SUMMARY
                 TO    TO    TO    TO    TO     THAN     TOTAL   TOTAL  AVERAGE
                02.9  05.9  09.9  15.9  25.0    25.0     COUNT  PERCENT  SPEED

         N                                                   0      0.0
       NNE                                                   0      0.0
        NE                                                   0      0.0
       ENE                                                   0      0.0
         E                                                   0      0.0
       ESE                                                   0      0.0
        SE                                                   0      0.0
       SSE                                                   0      0.0
         S                                                   0      0.0
       SSW                                                   0      0.0
        SW            12.5  25.0                             3     37.5      6.7
       WSW            12.5  12.5                             2     25.0      6.0
         W            12.5  12.5        12.5                 3     37.5     10.5
       WNW                                                   0      0.0
        NW                                                   0      0.0
       NNW                                                   0      0.0

      CALM                                                   0      0.0

 COL. TOTALS          37.5  50.0        12.5                 8               7.9
 1500 METER LEVEL WINDS AFTERNOON  FEBRUARY,1979
   DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
                00.1  03.0  06.0  10.0  16.0  GREATER      ROW   SUMMARY
                 TO    TO    TO    TO    TO     THAN     TOTAL   TOTAL  AVERAGE
                02.9  05.9  09.9  15.9  25.0    25.0     COUNT  PERCENT  SPEED

         N                                                   0      0.0
       NNE                                                   0      0.0
        NE                                                   0      0.0
       ENE                                                   0      0.0
         E                                                   0      0.0
       ESE                                                   0      0.0
        SE                                                   0      0.0
       SSE                                                   0      0.0
         S                                                   0      0.0
       SSW                                                   0      0.0
        SW                                                   0      0.0
       WSW            14.2  14.2                             2     28.4      7.1
         W            14.2  14.2                             2     28.4      5.7
       WNW      14.2        28.5                             3     42.7      6.0
        NW                                                   0      0.0
       NNW                                                   0      0.0

      CALM                                                   0      0.0

 COL. TOTALS    14.2  28.4  56.9                             7               6.2
```

```
                FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
CATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
0 METER LEVEL WINDS MORNING     FEBRUARY,1979
IRECTION     ********* WIND SPEEDS METERS/SECOND ****************************
              00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
               TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
              02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

    N                                                         0       0.0
  NNE                                                         0       0.0
   NE                                                         0       0.0
  ENE                                                         0       0.0
    E                                                         0       0.0
  ESE                                                         0       0.0
   SE                                                         0       0.0
  SSE                                                         0       0.0
    S                                                         0       0.0
  SSW                                                         0       0.0
   SW                16.6                                     1      16.6       5.5
  WSW                       16.6   16.6                       2      33.2      10.5
    W                       16.6   33.3                       3      49.9      12.4
  WNW                                                         0       0.0
   NW                                                         0       0.0
  NNW                                                         0       0.0

CALM                                                          0       0.0

. TOTALS             16.6   33.2   49.9                       6                10.6
0 METER LEVEL WINDS AFTERNOON   FEBRUARY,1979
IRECTION     ********* WIND SPEEDS METERS/SECOND ****************************
              00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
               TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
              02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

    N                                                         0       0.0
  NNE                                                         0       0.0
   NE                                                         0       0.0
  ENE                                                         0       0.0
    E                                                         0       0.0
  ESE                                                         0       0.0
   SE                                                         0       0.0
  SSE                                                         0       0.0
    S                                                         0       0.0
  SSW                                                         0       0.0
   SW                                                         0       0.0
  WSW                       40.0                              2      40.0       6.6
    W                       40.0   20.0                       3      60.0       8.1
  WNW                                                         0       0.0
   NW                                                         0       0.0
  NNW                                                         0       0.0

CALM                                                          0       0.0

. TOTALS                    80.0   20.0                       5                 7.5
```

```
          FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
2500 METER LEVEL WINDS MORNING     FEBRUARY,1979
  DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
              00.1  03.0  06.0  10.0  16.0  GREATER      ROW  SUMMARY
               TO    TO    TO    TO    TO    THAN      TOTAL  TOTAL  AVERAGE
              02.9  05.9  09.9  15.9  25.0   25.0      COUNT  PERCENT  SPEED

        N                                                0      0.0
      NNE                                                0      0.0
       NE                                                0      0.0
      ENE                                                0      0.0
        E                                                0      0.0
      ESE                                                0      0.0
       SE                                                0      0.0
      SSE                                                0      0.0
        S                                                0      0.0
      SSW                                                0      0.0
       SW                                                0      0.0
      WSW                                                0      0.0
        W                                                0      0.0
      WNW                                                0      0.0
       NW                                                0      0.0
      NNW                                                0      0.0

   CALM                                                  0      0.0

COL. TOTALS                                              0
2500 METER LEVEL WINDS AFTERNOON  FEBRUARY,1979
  DIRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
              00.1  03.0  06.0  10.0  16.0  GREATER      ROW  SUMMARY
               TO    TO    TO    TO    TO    THAN      TOTAL  TOTAL  AVERAGE
              02.9  05.9  09.9  15.9  25.0   25.0      COUNT  PERCENT  SPEED

        N                                                0      0.0
      NNE                                                0      0.0
       NE                                                0      0.0
      ENE                                                0      0.0
        E                                                0      0.0
      ESE                                                0      0.0
       SE                                                0      0.0
      SSE                                                0      0.0
        S                                                0      0.0
      SSW                                                0      0.0
       SW                                                0      0.0
      WSW                                                0      0.0
        W                                                0      0.0
      WNW                                                0      0.0
       NW                                                0      0.0
      NNW                                                0      0.0

   CALM                                                  0      0.0

COL. TOTALS                                              0
```

```
              FREQUENCY SUMMARY OF INVERSIONS (PERCENTAGES)
LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
               MONTH OF  FEBRUARY 1979     MORNING

       **************** INVERSION BASE HEIGHT (METERS) ***************
      SFC   001   101   251   501   751  1001  1501  2001  2501    >
CKNESS       TO    TO    TO    TO    TO    TO    TO    TO    TO  THAN      TOTAL
ETERS)      100   250   500   750  1000  1500  2000  2500  3000  3000

-100 11.4   2.8   2.8   8.5   2.8   5.7   8.5   5.7                         48.2

-250 11.4         8.5   2.8   5.7         5.7                               34.1

-500  2.8               8.5               2.8                               14.1

-750

AL   25.6   2.8  11.3  19.8   8.5   5.7  17.0   5.7

 INVERSION                                                                   2.0

                                              TOTAL NO. OF OCCURENCES        34

VERSION
TYPE

1           2.9   5.8   2.9              14.7   2.9                         29.2

2     2.9         5.8  11.7   5.8   5.8   2.9                               34.9

3    11.7               5.8   2.9               2.9                         23.3

4    11.7                                                                   11.7

5

               MONTH OF  FEBRUARY 1979     AFTERNOON

       **************** INVERSION BASE HEIGHT (METERS) ***************
      SFC   001   101   251   501   751  1001  1501  2001  2501    >
CKNESS       TO    TO    TO    TO    TO    TO    TO    TO    TO  THAN      TOTAL
ETERS)      100   250   500   750  1000  1500  2000  2500  3000  3000

-100              5.5  11.1   5.5        16.6                               38.7

-250  5.5         5.5  11.1  11.1         5.5   5.5                         44.2

-500

-750

AL    5.5        11.0  22.2  16.6        22.1   5.5

 INVERSION                                                                  16.0

                                              TOTAL NO. OF OCCURENCES        15

VERSION
TYPE

1     6.6         6.6  13.3   6.6        13.3                               46.4

2                 6.6  13.3   6.6        13.3   6.6                         46.4

3                             6.6                                            6.6

4

5
```

```
                      FREQUENCY SUMMARY OF MIXING HEIGHTS
   LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
  MIXING HEIGHTS -FREQUENCY OF OCCURENCE FOR  FEBRUARY  1979
MIXING HEIGHT          MORNING                AFTERNOON
 (METERS)            OCCURENCES             OCCURENCES

     0- 100               4                      0

   101- 250               4                      2

   251- 500               4                      1

   501- 750               1                      3

   751-1000               0                      0

  1001-1500               0                      0

      >1500               0                      2

      TOTAL              13                      8

  AVERAGE WIND SPEED
  THROUGH MIXED
  LAYER (M/SEC)         4.3                    6.4

  AVERAGE LAPSE RATE
  BELOW FIRST INVER.
     (DEG C /100M)  -01.64                 -00.99
```

```
                FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
CATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
      SURFACE WINDS MORNING        MARCH,1979
IRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
            00.1    03.0    06.0    10.0    16.0   GREATER      ROW    SUMMARY
             TO      TO      TO      TO      TO     THAN      TOTAL    TOTAL   AVERAGE
            02.9    05.9    09.9    15.9    25.0    25.0      COUNT   PERCENT   SPEED

   N                                                            0        0.0
 NNE                                                            0        0.0
  NE                                                            0        0.0
 ENE                                                            0        0.0
   E                                                            0        0.0
 ESE         6.2                                                1        6.2       .2
  SE                                                            0        0.0
 SSE                                                            0        0.0
   S        12.5                                                2       12.5      1.8
 SSW         6.2     6.2                                        2       12.4      3.1
  SW         6.2     6.2                                        2       12.4      2.9
 WSW         6.2                                                1        6.2      1.3
   W         6.2    12.5                                        3       18.7      3.9
 WNW                 6.2                                        1        6.2      4.5
  NW         6.2                                                1        6.2       .2
 NNW         6.2                                                1        6.2       .4

CALM                                                            2       12.0

. TOTALS    55.9    31.1                                       16                 2.1
      SURFACE WINDS AFTERNOON      MARCH,1979
IRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
            00.1    03.0    06.0    10.0    16.0   GREATER      ROW    SUMMARY
             TO      TO      TO      TO      TO     THAN      TOTAL    TOTAL   AVERAGE
            02.9    05.9    09.9    15.9    25.0    25.0      COUNT   PERCENT   SPEED

   N        11.1     5.5                                        3       16.6      2.0
 NNE        11.1                                                2       11.1      1.5
  NE         5.5                                                1        5.5       .9
 ENE                                                            0        0.0
   E                                                            0        0.0
 ESE         5.5                                                1        5.5       .9
  SE        11.1                                                2       11.1      1.7
 SSE        11.1                                                2       11.1      1.0
   S                                                            0        0.0
 SSW                 5.5                                        1        5.5      3.6
  SW                 5.5                                        1        5.5      3.6
 WSW                                                            0        0.0
   W                11.1     5.5                                3       16.6      5.2
 WNW                                                            0        0.0
  NW         5.5                                                1        5.5       .9
 NNW         5.5                                                1        5.5      1.3

CALM                                                            0        0.0

. TOTALS    66.4    27.6     5.5                               18                 2.3
```

# FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

## 100 METER LEVEL WINDS MORNING MARCH,1979

DIRECTION ********* WIND SPEEDS METERS/SECOND ****************************

| DIRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAG SPEED |
|---|---|---|---|---|---|---|---|---|---|
| N | | | | | | | 0 | 0.0 | |
| NNE | 12.5 | | | | | | 2 | 12.5 | 1.6 |
| NE | | | | | | | 0 | 0.0 | |
| ENE | 6.2 | | | | | | 1 | 6.2 | 1.4 |
| E | 6.2 | | | | | | 1 | 6.2 | 1.0 |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | 6.2 | 6.2 | | | | 2 | 12.4 | 5.9 |
| SSW | 6.2 | 18.7 | | | | | 4 | 24.9 | 4.6 |
| SW | | 6.2 | | | | | 1 | 6.2 | 5.5 |
| WSW | 6.2 | 6.2 | | | | | 2 | 12.4 | 3.2 |
| W | | | | 6.2 | | | 1 | 6.2 | 12.3 |
| WNW | | | | 12.5 | | | 2 | 12.5 | 14.9 |
| NW | | | | | | | 0 | 0.0 | |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 37.3 | 37.3 | 6.2 | 18.7 | | | 16 | | 5.6 |

## 100 METER LEVEL WINDS AFTERNOON MARCH,1979

DIRECTION ********* WIND SPEEDS METERS/SECOND ****************************

| DIRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAG SPEED |
|---|---|---|---|---|---|---|---|---|---|
| N | 11.1 | | 5.5 | | | | 3 | 16.6 | 3.7 |
| NNE | 5.5 | 11.1 | | | | | 3 | 16.6 | 3.6 |
| NE | | 5.5 | | | | | 1 | 5.5 | 4.7 |
| ENE | | | | | | | 0 | 0.0 | |
| E | | 5.5 | | | | | 1 | 5.5 | 4.3 |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | 5.5 | | | | 1 | 5.5 | 6.8 |
| SSE | 5.5 | 5.5 | | | | | 2 | 11.0 | 3.6 |
| S | | | | | | | 0 | 0.0 | |
| SSW | | | 5.5 | | | | 1 | 5.5 | 9.7 |
| SW | | 5.5 | | | | | 1 | 5.5 | 4.3 |
| WSW | | | | | | | 0 | 0.0 | |
| W | | | | 11.1 | | | 2 | 11.1 | 11.9 |
| WNW | | | | 5.5 | | | 1 | 5.5 | 15.4 |
| NW | 5.5 | | | | | | 1 | 5.5 | 2.4 |
| NNW | 5.5 | | | | | | 1 | 5.5 | 2.7 |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 33.1 | 33.1 | 16.5 | 16.6 | | | 18 | | 5.7 |

```
            FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
CCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
00 METER LEVEL WINDS MORNING      MARCH,1979
DIRECTION  ********* WIND SPEEDS METERS/SECOND *************************
           00.1  03.0  06.0  10.0  16.0  GREATER     ROW  SUMMARY
            TO    TO    TO    TO    TO    THAN    TOTAL  TOTAL   AVERAGE
           02.9  05.9  09.9  15.9  25.0   25.0    COUNT  PERCENT  SPEED

    N                                                 0     0.0
  NNE             12.5                                2    12.5     3.4
   NE                                                 0     0.0
  ENE                                                 0     0.0
    E        6.2                                      1     6.2     1.0
  ESE                                                 0     0.0
   SE        6.2                                      1     6.2      .5
  SSE                    6.2                          1     6.2     6.4
    S             12.5                                2    12.5     4.1
  SSW              6.2   6.2                          2    12.4     5.7
   SW        6.2   6.2                                2    12.4     3.5
  WSW        6.2                                      1     6.2     2.2
    W              6.2         6.2                    2    12.4     6.8
  WNW                    6.2   6.2                    2    12.4    12.2
   NW                                                 0     0.0
  NNW                                                 0     0.0

 CALM                                                 0     0.0

L. TOTALS   24.8  43.6  18.6  12.4                   16             5.1
00 METER LEVEL WINDS AFTERNOON    MARCH,1979
DIRECTION  ********* WIND SPEEDS METERS/SECOND *************************
           00.1  03.0  06.0  10.0  16.0  GREATER     ROW  SUMMARY
            TO    TO    TO    TO    TO    THAN    TOTAL  TOTAL   AVERAGE
           02.9  05.9  09.9  15.9  25.0   25.0    COUNT  PERCENT  SPEED

    N                                                 0     0.0
  NNE        5.5  11.1   5.5                          4    22.1     4.6
   NE                    5.5                          1     5.5     6.0
  ENE                                                 0     0.0
    E                                                 0     0.0
  ESE              5.5   5.5                          2    11.0     4.8
   SE                          5.5                    1     5.5    11.4
  SSE                    5.5                          1     5.5     6.5
    S        5.5                                      1     5.5      .6
  SSW              5.5                                1     5.5     4.3
   SW        5.5   5.5                                2    11.0     2.1
  WSW                                                 0     0.0
    W                   11.1   5.5                    3    16.6    10.1
  WNW        5.5                                      1     5.5      .5
   NW        5.5                                      1     5.5      .9
  NNW                                                 0     0.0

 CALM                                                 0     0.0

L. TOTALS   27.5  27.6  33.1  11.0                   18             5.1
```

## FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

300 METER LEVEL WINDS MORNING MARCH,1979

| DIRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| | ********* WIND SPEEDS METERS/SECOND ********* | | | | | | | | |
| N | | 6.2 | | | | | 1 | 6.2 | 5.6 |
| NNE | | 6.2 | | | | | 1 | 6.2 | 5.7 |
| NE | 6.2 | | | | | | 1 | 6.2 | 2.0 |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | | 6.2 | | | | 1 | 6.2 | 6.6 |
| SSW | 6.2 | | 6.2 | | | | 2 | 12.4 | 4.0 |
| SW | 6.2 | 6.2 | 6.2 | | | | 3 | 18.6 | 4.3 |
| WSW | | | | | | | 0 | 0.0 | |
| W | | 6.2 | | 6.2 | | | 2 | 12.4 | 6.7 |
| WNW | 6.2 | 6.2 | 6.2 | 6.2 | | | 4 | 24.8 | 6.5 |
| NW | | 6.2 | | | | | 1 | 6.2 | 3.3 |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 24.8 | 37.2 | 24.8 | 12.4 | | | 16 | | 5.2 |

300 METER LEVEL WINDS AFTERNOON MARCH,1979

| DIRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| | ********* WIND SPEEDS METERS/SECOND ********* | | | | | | | | |
| N | | | | | | | 0 | 0.0 | |
| NNE | 11.7 | 5.8 | | | | | 3 | 17.5 | 1.9 |
| NE | | 11.7 | | | | | 2 | 11.7 | 3.7 |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | 5.8 | | | | | 1 | 5.8 | 5.5 |
| SE | | | | 5.8 | | | 1 | 5.8 | 12.2 |
| SSE | | 5.8 | 5.8 | | | | 2 | 11.6 | 6.3 |
| S | | | | | | | 0 | 0.0 | |
| SSW | | | 5.8 | | | | 1 | 5.8 | 6.3 |
| SW | 11.7 | | | | | | 2 | 11.7 | 1.9 |
| WSW | | 5.8 | 5.8 | | | | 2 | 11.6 | 6.3 |
| W | | | 5.8 | 5.8 | | | 2 | 11.6 | 9.4 |
| WNW | | 5.8 | | | | | 1 | 5.8 | 4.9 |
| NW | | | | | | | 0 | 0.0 | |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 23.4 | 40.7 | 23.2 | 11.6 | | | 17 | | 5.2 |

```
                FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAFS)
00 METER LEVEL WINDS MORNING          MARCH,1979
DIRECTION   ********* WIND SPEEDS METERS/SECOND ****************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

     N                                                       0      0.0
   NNE                      6.2                              1      6.2      6.2
    NE        6.2           6.2                              2     12.4      3.6
   ENE                                                       0      0.0
     E                                                       0      0.0
   ESE                                                       0      0.0
    SE                                                       0      0.0
   SSE                                                       0      0.0
     S                                                       0      0.0
   SSW               25.0   6.2                              5     31.2      5.2
    SW                             6.2                       1      6.2     13.4
   WSW                                                       0      0.0
     W               12.5   6.2                              3     18.7      5.2
   WNW                     12.5                              2     12.5      8.5
    NW        6.2     6.2                                    2     12.4      4.2
   NNW                                                       0      0.0

  CALM                                                       0      0.0

L. TOTALS    12.4   43.7   37.3    6.2                      16               5.8
00 METER LEVEL WINDS AFTERNOON        MARCH,1979
DIRECTION   ********* WIND SPEEDS METERS/SECOND ****************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
             02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

     N                                                       0      0.0
   NNE        5.8           5.8                              2     11.6      4.1
    NE                                                       0      0.0
   ENE                                                       0      0.0
     E                                                       0      0.0
   ESE        5.8                                            1      5.8      2.8
    SE        5.8                                            1      5.8       .7
   SSE        5.8                                            1      5.8      2.4
     S       11.7                                            2     11.7      2.0
   SSW                5.8                                    1      5.8      3.3
    SW        5.8     5.8                                    2     11.6      2.8
   WSW        5.8                                            1      5.8      2.8
     W                      5.8   11.7    5.8                4     23.3     13.6
   WNW        5.8     5.8                                    2     11.6      2.6
    NW                                                       0      0.0
   NNW                                                       0      0.0

  CALM                                                       0      0.0

L. TOTALS    52.3   17.4   11.6   11.7    5.8               17               5.2
```

## FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

750 METER LEVEL WINDS MORNING MARCH,1979

| DIRECTION | ********* WIND SPEEDS METERS/SECOND *************************** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGI SPEED |
| N | | 6.2 | | | | | 1 | 6.2 | 4.7 |
| NNE | | | | | | | 0 | 0.0 | |
| NE | | 6.2 | | | | | 1 | 6.2 | 4.8 |
| ENE | | | | | | | 0 | 0.0 | |
| E | 6.2 | | | | | | 1 | 6.2 | 2.9 |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | 6.2 | | | | | | 1 | 6.2 | 1.0 |
| SSW | | | 6.2 | 6.2 | | | 2 | 12.4 | 10.3 |
| SW | | | | | | | 0 | 0.0 | |
| WSW | | | 6.2 | | | | 1 | 6.2 | 7.0 |
| W | 6.2 | 12.5 | | | | | 3 | 18.7 | 3.5 |
| WNW | | 12.5 | 6.2 | 6.2 | | | 4 | 24.9 | 7.3 |
| NW | | 6.2 | | | | | 1 | 6.2 | 3.3 |
| NNW | | 6.2 | | | | | 1 | 6.2 | 5.5 |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 18.6 | 49.8 | 18.6 | 12.4 | | | 16 | | 5.5 |

750 METER LEVEL WINDS AFTERNOON MARCH,1979

| DIRECTION | ********* WIND SPEEDS METERS/SECOND *************************** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
| N | | | | | | | 0 | 0.0 | |
| NNE | | | | | | | 0 | 0.0 | |
| NE | 5.8 | | | | | | 1 | 5.8 | 2.6 |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | 5.8 | | | | | 1 | 5.8 | 3.2 |
| S | 5.8 | | | | | | 1 | 5.8 | 2.6 |
| SSW | | 11.7 | 5.8 | | | | 3 | 17.5 | 4.7 |
| SW | | | 5.8 | | | | 1 | 5.8 | 6.1 |
| WSW | 5.8 | | 5.8 | | | | 2 | 11.6 | 5.1 |
| W | | 11.7 | | 11.7 | 5.8 | | 5 | 29.2 | 11.2 |
| WNW | 5.8 | | 5.8 | | | | 2 | 11.6 | 5.0 |
| NW | | | | | | | 0 | 0.0 | |
| NNW | 5.8 | | | | | | 1 | 5.8 | 1.7 |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 29.0 | 29.2 | 23.2 | 11.7 | 5.8 | | 17 | | 6.2 |

FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

00 METER LEVEL WINDS MORNING MARCH,1979

********* WIND SPEEDS METERS/SECOND ****************************

| IRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| N | | 6.6 | | | | | 1 | 6.6 | 3.2 |
| NNE | | | | | | | 0 | 0.0 | |
| NE | | | | | | | 0 | 0.0 | |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | 6.6 | | | | | | 1 | 6.6 | 2.4 |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | | | | | | 0 | 0.0 | |
| SSW | | 6.6 | | 13.3 | | | 3 | 19.9 | 9.4 |
| SW | | | | | | | 0 | 0.0 | |
| WSW | | 13.3 | | | | | 2 | 13.3 | 3.6 |
| W | 6.6 | 6.6 | | | | | 2 | 13.2 | 4.1 |
| WNW | 6.6 | 6.6 | | 6.6 | | | 3 | 19.8 | 6.1 |
| NW | | | 6.6 | 6.6 | | | 2 | 13.2 | 9.2 |
| NNW | | | 6.6 | | | | 1 | 6.6 | 8.4 |
| CALM | | | | | | | 0 | 0.0 | |
| . TOTALS | 19.8 | 39.7 | 13.2 | 26.5 | | | 15 | | 6.3 |

00 METER LEVEL WINDS AFTERNOON MARCH,1979

********* WIND SPEEDS METERS/SECOND ****************************

| IRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| N | | | | | | | 0 | 0.0 | |
| NNE | | | | | | | 0 | 0.0 | |
| NE | | | | | | | 0 | 0.0 | |
| ENE | | 5.8 | | | | | 1 | 5.8 | 3.3 |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | 5.8 | | | | 1 | 5.8 | 9.7 |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | 5.8 | | | | | 1 | 5.8 | 3.9 |
| S | | | | | | | 0 | 0.0 | |
| SSW | | 11.7 | 11.7 | | | | 4 | 23.4 | 5.7 |
| SW | | | 5.8 | | | | 1 | 5.8 | 9.2 |
| WSW | | 5.8 | | | | | 1 | 5.8 | 4.2 |
| W | | 5.8 | 11.7 | | 11.7 | | 5 | 29.2 | 13.7 |
| WNW | | | 5.8 | | | | 1 | 5.8 | 6.1 |
| NW | | | | 5.8 | | | 1 | 5.8 | 12.0 |
| NNW | 5.8 | | | | | | 1 | 5.8 | 1.6 |
| CALM | | | | | | | 0 | 0.0 | |
| . TOTALS | 5.8 | 34.9 | 40.8 | 5.8 | 11.7 | | 17 | | 8.3 |

FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

1500 METER LEVEL WINDS MORNING MARCH,1979

| DIRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAG SPEED |
|---|---|---|---|---|---|---|---|---|---|
| | ********* WIND SPEEDS METERS/SECOND ********* | | | | | | | | |
| N | | | 7.1 | | | | 1 | 7.1 | 7.9 |
| NNE | | 7.1 | | | | | 1 | 7.1 | 5.6 |
| NE | | | | | | | 0 | 0.0 | |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | | | | | | 0 | 0.0 | |
| SSW | | | | | | | 0 | 0.0 | |
| SW | | | 7.1 | | 14.2 | | 3 | 21.3 | 14.4 |
| WSW | | | | 7.1 | | | 1 | 7.1 | 14.3 |
| W | | 7.1 | 7.1 | | | | 2 | 14.2 | 6.9 |
| WNW | 7.1 | 7.1 | | 7.1 | | | 3 | 21.3 | 5.5 |
| NW | | | 7.1 | | | 7.1 | 2 | 14.2 | 22.0 |
| NNW | | | 7.1 | | | | 1 | 7.1 | 9.5 |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 7.1 | 21.3 | 35.5 | 14.2 | 14.2 | 7.1 | 14 | | 11.0 |

1500 METER LEVEL WINDS AFTERNOON MARCH,1979

| DIRECTION | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAG SPEED |
|---|---|---|---|---|---|---|---|---|---|
| | ********* WIND SPEEDS METERS/SECOND ********* | | | | | | | | |
| N | | | | | | | 0 | 0.0 | |
| NNE | | | | | | | 0 | 0.0 | |
| NE | | | | | | | 0 | 0.0 | |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | 7.1 | | | | | 1 | 7.1 | 3.0 |
| SSW | | | | | | | 0 | 0.0 | |
| SW | | 7.1 | 14.2 | | | | 3 | 21.3 | 6.5 |
| WSW | | 7.1 | | | | | 1 | 7.1 | 3.1 |
| W | | | 14.2 | 7.1 | | | 3 | 21.3 | 9.0 |
| WNW | | | 14.2 | | | | 2 | 14.2 | 6.4 |
| NW | 7.1 | 7.1 | | 7.1 | 7.1 | | 4 | 28.4 | 8.8 |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 7.1 | 28.4 | 42.6 | 14.2 | 7.1 | | 14 | | 7.2 |

```
            FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
CATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
0 METER LEVEL WINDS MORNING       MARCH,1979
IRECTION  ********* WIND SPEEDS METERS/SECOND ****************************
           00.1  03.0  06.0  10.0  16.0  GREATER     ROW  SUMMARY
            TO    TO    TO    TO    TO    THAN    TOTAL   TOTAL  AVERAGE
           02.9  05.9  09.9  15.9  25.0   25.0    COUNT  PERCENT  SPEED

   N                                                  0     0.0
 NNE                                                  0     0.0
  NE                                                  0     0.0
 ENE                                                  0     0.0
   E                                                  0     0.0
 ESE                                                  0     0.0
  SE                                                  0     0.0
 SSE                                                  0     0.0
   S                                                  0     0.0
 SSW                                                  0     0.0
  SW             10.0  10.0        10.0               3    30.0    11.3
 WSW             10.0              10.0               2    20.0    11.6
   W             10.0                                 1    10.0     4.3
 WNW                   10.0                           1    10.0     8.2
  NW                                       10.0       1    10.0    30.3
 NNW                         20.0                     2    20.0    13.3

CALM                                                  0     0.0

. TOTALS         30.0  20.0  20.0  20.0    10.0      10            12.6
0 METER LEVEL WINDS AFTERNOON     MARCH,1979
IRECTION  ********* WIND SPEEDS METERS/SECOND ****************************
           00.1  03.0  06.0  10.0  16.0  GREATER     ROW  SUMMARY
            TO    TO    TO    TO    TO    THAN    TOTAL   TOTAL  AVERAGE
           02.9  05.9  09.9  15.9  25.0   25.0    COUNT  PERCENT  SPEED

   N                   12.5                           1    12.5     8.3
 NNE                                                  0     0.0
  NE                                                  0     0.0
 ENE                                                  0     0.0
   E                                                  0     0.0
 ESE                                                  0     0.0
  SE             12.5                                 1    12.5     3.2
 SSE                                                  0     0.0
   S                                                  0     0.0
 SSW                         12.5                     1    12.5    13.0
  SW                                                  0     0.0
 WSW       12.5        12.5                           2    25.0     4.0
   W                                                  0     0.0
 WNW                         12.5                     1    12.5    12.6
  NW                               12.5               1    12.5    20.2
 NNW                         12.5                     1    12.5    11.5

CALM                                                  0     0.0

. TOTALS   12.5  12.5  25.0  37.5  12.5                8             9.6
```

```
                 FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
  LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
 2500 METER LEVEL WINDS MORNING        MARCH,1979

   DIRECTION   ********* WIND SPEEDS METERS/SECOND *************************
               00.1  03.0  06.0  10.0  16.0  GREATER     ROW  SUMMARY
                TO    TO    TO    TO    TO     THAN    TOTAL   TOTAL  AVERAG
               02.9  05.9  09.9  15.9  25.0    25.0    COUNT  PERCENT  SPEED

        N                                                0      0.0
      NNE                                                0      0.0
       NE                                                0      0.0
      ENE                                                0      0.0
        E                                                0      0.0
      ESE                                                0      0.0
       SE                                                0      0.0
      SSE                                                0      0.0
        S                                                0      0.0
      SSW                                                0      0.0
       SW                                                0      0.0
      WSW                                                0      0.0
        W                                                0      0.0
      WNW                                                0      0.0
       NW                                                0      0.0
      NNW                                                0      0.0

     CALM                                                0      0.0

 COL. TOTALS                                             0

 2500 METER LEVEL WINDS AFTERNOON      MARCH,1979

   DIRECTION   ********* WIND SPEEDS METERS/SECOND *************************
               00.1  03.0  06.0  10.0  16.0  GREATER     ROW  SUMMARY
                TO    TO    TO    TO    TO     THAN    TOTAL   TOTAL  AVERAG
               02.9  05.9  09.9  15.9  25.0    25.0    COUNT  PERCENT  SPEED

        N                                                0      0.0
      NNE                                                0      0.0
       NE                                                0      0.0
      ENE                                                0      0.0
        E                                                0      0.0
      ESE                                                0      0.0
       SE                                                0      0.0
      SSE                                                0      0.0
        S                                                0      0.0
      SSW                                                0      0.0
       SW                                                0      0.0
      WSW                                                0      0.0
        W                                                0      0.0
      WNW                                                0      0.0
       NW                                                0      0.0
      NNW                                                0      0.0

     CALM                                                0      0.0

 COL. TOTALS                                             0
```

```
              FREQUENCY SUMMARY OF INVERSIONS (PERCENTAGES)
LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
               MONTH OF     MARCH 1979    MORNING

       ****************  INVERSION BASE HEIGHT (METERS) ***************
       SFC   001   101   251   501   751  1001  1501  2001  2501   >
KNESS        TO    TO    TO    TO    TO    TO    TO    TO    TO  THAN   TOTAL
TERS)        100   250   500   750  1000  1500  2000  2500  3000  3000

100   2.9   2.9   5.8   2.9         2.9  14.7   5.8                     37.9

250  20.5                 5.8   2.9         5.8   5.8                     40.8

500   2.9         5.8                       2.9                           11.6

750

L    26.3   2.9  11.6   8.7   2.9   2.9  23.4  11.6

INVERSION                                                                  8.0

                                               TOTAL NO. OF OCCURENCES     31

ERSION
YPE

                  3.2   6.4   3.2   3.2  16.1   3.2                     35.3

      6.4   3.2   3.2   3.2                 6.4   6.4                     28.8

     19.3         6.4                       3.2   3.2                     32.1

      3.2                                                                  3.2


               MONTH OF     MARCH 1979    AFTERNOON

       ****************  INVERSION BASE HEIGHT (METERS) ***************
       SFC   001   101   251   501   751  1001  1501  2001  2501   >
KNESS        TO    TO    TO    TO    TO    TO    TO    TO    TO  THAN   TOTAL
TERS)        100   250   500   750  1000  1500  2000  2500  3000  3000

100   9.5   4.7   4.7         4.7   4.7   9.5  14.2                     52.0

250   4.7                                   4.7   9.5                     18.9

500                     4.7                                                4.7

750

L    14.2   4.7   4.7   4.7   4.7   4.7  14.2  23.7

INVERSION                                                                 23.0

                                               TOTAL NO. OF OCCURENCES     16

ERSION
YPE

     12.5                     6.2   6.2   6.2  25.0                     56.1

      6.2                                   6.2   6.2                     18.6

                  6.2   6.2                 6.2                           18.6

            6.2                                                            6.2
```

```
                    FREQUENCY SUMMARY OF MIXING HEIGHTS
   LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
  MIXING HEIGHTS -FREQUENCY OF OCCURENCE FOR     MARCH  1979
 MIXING HEIGHT        MORNING            AFTERNOON
  (METERS)          OCCURENCES          OCCURENCES
     0- 100              5                   0
   101- 250              4                   1
   251- 500              1                   3
   501- 750              1                   2
   751-1000              2                   0
  1001-1500              2                   2
      >1500              1                   6
      TOTAL             16                  14

  AVERAGE WIND SPEED
  THROUGH MIXED
  LAYER (M/SEC)        4.7                 6.9

  AVERAGE LAPSE RATE
  BELOW FIRST INVER.
     (DEG C /100M)   -00.65              -01.21
```

```
               FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
CATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

       SURFACE WINDS MORNING        APRIL,1979

IRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
             02.9   05.9   09.9   15.9   25.0   25.0       COUNT  PERCENT  SPEED

    N                                                        0      0.0
  NNE        8.3                                             1      8.3      1.3
   NE        8.3                                             1      8.3      1.8
  ENE                                                        0      0.0
    E                                                        0      0.0
  ESE                                                        0      0.0
   SE                                                        0      0.0
  SSE        8.3                                             1      8.3      1.8
    S        8.3                                             1      8.3       .9
  SSW               8.3                                      1      8.3      4.5
   SW        8.3    8.3                                      2     16.6      2.9
  WSW       16.6                                             2     16.6      2.0
    W                                                        0      0.0
  WNW                                                        0      0.0
   NW        8.3                                             1      8.3       .2
  NNW                                                        0      0.0

 CALM                                                        2     16.0

. TOTALS    66.4   16.6                                     12               1.6

       SURFACE WINDS AFTERNOON      APRIL,1979

IRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
             00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
              TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
             02.9   05.9   09.9   15.9   25.0   25.0       COUNT  PERCENT  SPEED

    N               7.1                                      1      7.1      3.6
  NNE       14.2                                             2     14.2       .6
   NE       21.4                                             3     21.4      1.4
  ENE                                                        0      0.0
    E                                                        0      0.0
  ESE                                                        0      0.0
   SE               7.1                                      1      7.1      4.5
  SSE                                                        0      0.0
    S        7.1                                             1      7.1      2.2
  SSW               7.1                                      1      7.1      4.5
   SW                                                        0      0.0
  WSW               7.1                                      1      7.1      3.6
    W               7.1                                      1      7.1      3.6
  WNW              14.2                                      2     14.2      4.0
   NW        7.1                                             1      7.1      1.8
  NNW                                                        0      0.0

 CALM                                                        0      0.0

. TOTALS    49.8   49.7                                     14               2.6
```

## FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

100 METER LEVEL WINDS MORNING APRIL,1979

| DIRECTION | ********* WIND SPEEDS METERS/SECOND | ************************** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
| N | | 8.3 | | | | | 1 | 8.3 | 3.4 |
| NNE | | 8.3 | | | | | 1 | 8.3 | 4.9 |
| NE | | | | | | | 0 | 0.0 | |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | 16.6 | | | | | 2 | 16.6 | 4.9 |
| SSW | 8.3 | | | 8.3 | | | 2 | 16.6 | 8.2 |
| SW | | | | 8.3 | | | 1 | 8.3 | 11.4 |
| WSW | 8.3 | 8.3 | | | | | 2 | 16.6 | 3.0 |
| W | | | | | | | 0 | 0.0 | |
| WNW | 16.6 | | | | | | 2 | 16.6 | .6 |
| NW | | | | | | | 0 | 0.0 | |
| NNW | | 8.3 | | | | | 1 | 8.3 | 3.1 |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 33.2 | 49.8 | | 16.6 | | | 12 | | 4.6 |

100 METER LEVEL WINDS AFTERNOON APRIL,1979

| DIRECTION | ********* WIND SPEEDS METERS/SECOND | ************************** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
| N | 7.1 | | 7.1 | | | | 2 | 14.2 | 3.7 |
| NNE | | 7.1 | | | | | 1 | 7.1 | 3.3 |
| NE | | | 14.2 | | | | 2 | 14.2 | 7.4 |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | 7.1 | | | | | 1 | 7.1 | 4.7 |
| SSE | | | | | | | 0 | 0.0 | |
| S | | 7.1 | | | | | 1 | 7.1 | 4.1 |
| SSW | | | 7.1 | | | | 1 | 7.1 | 9.2 |
| SW | | | | | | | 0 | 0.0 | |
| WSW | | | | 7.1 | | | 1 | 7.1 | 14.9 |
| W | | | | 7.1 | | | 1 | 7.1 | 11.1 |
| WNW | | | | 7.1 | | | 1 | 7.1 | 10.4 |
| NW | | | 7.1 | 7.1 | | | 2 | 14.2 | 11.8 |
| NNW | 7.1 | | | | | | 1 | 7.1 | .6 |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 14.2 | 21.3 | 35.5 | 28.4 | | | 14 | | 7.4 |

```
          FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
CATION: DEER LODGE CO - HIWAY JUNCTION - MLT (MAPS)
O METER LEVEL WINDS MORNING        APRIL.1979
IRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
           00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
            TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
           02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

   N        8.3                                            1      8.3      .8
  NNE       8.3                                            1      8.3      .7
   NE                                                      0      0.0
  ENE                                                      0      0.0
   E                                                       0      0.0
  ESE                                                      0      0.0
   SE                                                      0      0.0
  SSE       8.3                                            1      8.3     2.9
   S        8.3    8.3                                     2     16.6     2.6
  SSW                           8.3                        1      8.3    11.2
   SW                    8.3                               1      8.3     9.0
  WSW                                                      0      0.0
   W                                                       0      0.0
  WNW      16.6    8.3                                     3     24.9     2.5
   NW                                                      0      0.0
  NNW             16.6                                     2     16.6     4.8

 CALM                                                      0      0.0

.. TOTALS  49.8   33.2    8.3    8.3                      12              3.9
O METER LEVEL WINDS AFTERNOON       APRIL.1979
IRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
           00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
            TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL  AVERAGE
           02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT  SPEED

   N                     7.1                               1      7.1     8.6
  NNE       7.1                                            1      7.1     2.8
   NE                    7.1                               1      7.1     6.8
  ENE       7.1    7.1                                     2     14.2     2.6
   E                                                       0      0.0
  ESE                                                      0      0.0
   SE       7.1                                            1      7.1     1.8
  SSE                    7.1                               1      7.1     7.7
   S                                                       0      0.0
  SSW              7.1                  7.1                2     14.2    14.5
   SW                                                      0      0.0
  WSW                    7.1                               1      7.1     7.1
   W                                    7.1                1      7.1    17.2
  WNW                    7.1   14.2                        3     21.3     9.4
   NW                                                      0      0.0
  NNW                                                      0      0.0

 CALM                                                      0      0.0

. TOTALS   21.3   14.2   35.5   14.2   14.2               14              8.1
```

## FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MLT (MAPS)

300 METER LEVEL WINDS MORNING APRIL,1979

| DIRECTION | ********* WIND SPEEDS METERS/SECOND ********* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
| N | | 8.3 | | | | | 1 | 8.3 | 4.7 |
| NNE | | | | | | | 0 | 0.0 | |
| NE | 8.3 | | | | | | 1 | 8.3 | .7 |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | 8.3 | | | | | 1 | 8.3 | 5.3 |
| S | 8.3 | | | | | | 1 | 8.3 | 1.7 |
| SSW | 16.6 | | | | | | 2 | 16.6 | 1.5 |
| SW | | | | | 8.3 | | 1 | 8.3 | 16.0 |
| WSW | 8.3 | | | | | | 1 | 8.3 | .3 |
| W | | 8.3 | | | | | 1 | 8.3 | 4.4 |
| WNW | | 16.6 | | | | | 2 | 16.6 | 5.1 |
| NW | | 8.3 | | | | | 1 | 8.3 | 5.0 |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| CUL. TOTALS | 41.5 | 49.8 | | | 8.3 | | 12 | | 4.2 |

300 METER LEVEL WINDS AFTERNOON APRIL,1979

| DIRECTION | ********* WIND SPEEDS METERS/SECOND ********* | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
| N | | | | | | | 0 | 0.0 | |
| NNE | | | | 7.1 | | | 1 | 7.1 | 10.9 |
| NE | | | | 7.1 | | | 1 | 7.1 | 10.7 |
| ENE | 7.1 | | 7.1 | | | | 2 | 14.2 | 4.2 |
| E | | | | | | | 0 | 0.0 | |
| ESE | 7.1 | | | | | | 1 | 7.1 | 1.6 |
| SE | | | 7.1 | | | | 1 | 7.1 | 6.3 |
| SSE | | | | | | | 0 | 0.0 | |
| S | | | | | | | 0 | 0.0 | |
| SSW | 7.1 | | | | | | 1 | 7.1 | 2.6 |
| SW | 7.1 | | | 7.1 | | | 2 | 14.2 | 6.0 |
| WSW | | | | 7.1 | | | 1 | 7.1 | 13.7 |
| W | | | | | | | 0 | 0.0 | |
| WNW | | 14.2 | | | 7.1 | | 3 | 21.3 | 10.7 |
| NW | | | | | | | 0 | 0.0 | |
| NNW | 7.1 | | | | | | 1 | 7.1 | 2.6 |
| CALM | | | | | | | 0 | 0.0 | |
| CUL. TOTALS | 35.5 | 14.2 | 14.2 | 28.4 | 7.1 | | 14 | | 7.2 |

FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

OCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

0 METER LEVEL WINDS MORNING APRIL,1979

| IRECTION | ********* WIND SPEEDS METERS/SECOND 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| N | | | | | | | 0 | 0.0 | |
| NNE | | | | | | | 0 | 0.0 | |
| NE | | | | | | | 0 | 0.0 | |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | 8.3 | | 8.3 | | | | 2 | 16.6 | 3.6 |
| S | 8.3 | | 8.3 | | | | 2 | 16.6 | 3.7 |
| SSW | | | | | | | 0 | 0.0 | |
| SW | | | | | 16.6 | | 2 | 16.6 | 20.0 |
| WSW | | | | | | | 0 | 0.0 | |
| W | 8.3 | 8.3 | 8.3 | | | | 3 | 24.9 | 4.9 |
| WNW | 8.3 | | | 16.6 | | | 3 | 24.9 | 9.5 |
| NW | | | | | | | 0 | 0.0 | |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| . TOTALS | 33.2 | 8.3 | 24.9 | 16.6 | 16.6 | | 12 | | 8.1 |

0 METER LEVEL WINDS AFTERNOON APRIL,1979

| IRECTION | ********* WIND SPEEDS METERS/SECOND 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
|---|---|---|---|---|---|---|---|---|---|
| N | 7.1 | | | | | | 1 | 7.1 | 1.3 |
| NNE | | 7.1 | | | | | 1 | 7.1 | 5.2 |
| NE | | | 7.1 | 7.1 | | | 2 | 14.2 | 8.3 |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | 7.1 | | | | | | 1 | 7.1 | 2.7 |
| SE | | | | | | | 0 | 0.0 | |
| SSE | 7.1 | | 7.1 | | | | 2 | 14.2 | 5.6 |
| S | | | | | | | 0 | 0.0 | |
| SSW | | 7.1 | | | | | 1 | 7.1 | 3.5 |
| SW | | | 7.1 | 7.1 | | | 2 | 14.2 | 9.6 |
| WSW | | 7.1 | | | | | 1 | 7.1 | 3.2 |
| W | | | 7.1 | | | | 1 | 7.1 | 6.6 |
| WNW | | 7.1 | | | | | 1 | 7.1 | 4.7 |
| NW | | 7.1 | | | | | 1 | 7.1 | 3.2 |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| . TOTALS | 21.3 | 35.5 | 28.4 | 14.2 | | | 14 | | 5.5 |

# FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

750 METER LEVEL WINDS MORNING APRIL,1979

| DIRECTION | ********* WIND SPEEDS METERS/SECOND ******************************* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
| N | | | | | | | 0 | 0.0 | |
| NNE | | | | | | | 0 | 0.0 | |
| NE | | | | | | | 0 | 0.0 | |
| ENE | | | | | | | 0 | 0.0 | |
| E | | | | | | | 0 | 0.0 | |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | 8.3 | | | | | 1 | 8.3 | 4.0 |
| SSW | | | 8.3 | | | | 1 | 8.3 | 6.0 |
| SW | | 8.3 | 8.3 | | | | 2 | 16.6 | 4.9 |
| WSW | | | | 8.3 | | | 1 | 8.3 | 15.6 |
| W | 8.3 | 8.3 | | | 8.3 | | 3 | 24.9 | 7.9 |
| WNW | 16.6 | | 8.3 | | | | 3 | 24.9 | 4.4 |
| NW | 8.3 | | | | | | 1 | 8.3 | 1.4 |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 33.2 | 24.9 | 24.9 | 8.3 | 8.3 | | 12 | | 6.1 |

750 METER LEVEL WINDS AFTERNOON APRIL,1979

| DIRECTION | ********* WIND SPEEDS METERS/SECOND ******************************* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 00.1 TO 02.9 | 03.0 TO 05.9 | 06.0 TO 09.9 | 10.0 TO 15.9 | 16.0 TO 25.0 | GREATER THAN 25.0 | ROW TOTAL COUNT | SUMMARY TOTAL PERCENT | AVERAGE SPEED |
| N | | | | | | | 0 | 0.0 | |
| NNE | | | | | | | 0 | 0.0 | |
| NE | | | | | 9.0 | | 1 | 9.0 | 16.3 |
| ENE | | | | | | | 0 | 0.0 | |
| E | 9.0 | | | | | | 1 | 9.0 | 2.0 |
| ESE | | | | | | | 0 | 0.0 | |
| SE | | | | | | | 0 | 0.0 | |
| SSE | | | | | | | 0 | 0.0 | |
| S | | | 9.0 | | | | 1 | 9.0 | 9.9 |
| SSW | 9.0 | | | | | | 1 | 9.0 | 2.4 |
| SW | | 9.0 | | | | | 1 | 9.0 | 4.7 |
| WSW | | 9.0 | | | | | 1 | 9.0 | 5.0 |
| W | | 9.0 | 9.0 | | | 9.0 | 3 | 27.0 | 20.5 |
| WNW | | | 9.0 | | | | 1 | 9.0 | 7.5 |
| NW | | 9.0 | | | | | 1 | 9.0 | 5.7 |
| NNW | | | | | | | 0 | 0.0 | |
| CALM | | | | | | | 0 | 0.0 | |
| COL. TOTALS | 18.0 | 36.0 | 27.0 | | 9.0 | 9.0 | 11 | | 10.4 |

```
                FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
CATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
0 METER LEVEL WINDS MORNING        APRIL.1979
IRECTION   ********* WIND SPEEDS METERS/SECOND ****************************
            00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
             TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
            02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

   N                                                          0      0.0
 NNE                                                          0      0.0
  NE                                                          0      0.0
 ENE         8.3                                              1      8.3       2.3
   E                                                          0      0.0
 ESE                8.3                                       1      8.3       3.3
  SE                                                          0      0.0
 SSE                                                          0      0.0
   S                                                          0      0.0
 SSW                8.3    8.3    8.3                         3     24.9       8.1
  SW                                                          0      0.0
 WSW                                     8.3                  1      8.3      21.4
   W         8.3   16.6           8.3                         4     33.2       6.2
 WNW                                                          0      0.0
  NW                       8.3    8.3                         2     16.6       9.4
 NNW                                                          0      0.0

CALM                                                          0      0.0

. TOTALS    16.6   33.2   16.6   24.9    8.3                 12                7.9
0 METER LEVEL WINDS AFTERNOON      APRIL.1979
IRECTION   ********* WIND SPEEDS METERS/SECOND ****************************
            00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
             TO     TO     TO     TO     TO     THAN      TOTAL   TOTAL   AVERAGE
            02.9   05.9   09.9   15.9   25.0    25.0      COUNT  PERCENT   SPEED

   N                                                          0      0.0
 NNE                                                          0      0.0
  NE                                                          0      0.0
 ENE                                                          0      0.0
   E                                                          0      0.0
 ESE                                                          0      0.0
  SE                                                          0      0.0
 SSE        11.1          11.1                                2     22.2       4.2
   S                      11.1                                1     11.1       7.5
 SSW                                                          0      0.0
  SW               11.1          11.1                         2     22.2       7.4
 WSW        11.1                                              1     11.1       2.9
   W                      11.1          22.2                  3     33.3      15.9
 WNW                                                          0      0.0
  NW                                                          0      0.0
 NNW                                                          0      0.0

CALM                                                          0      0.0

. TOTALS    22.2   11.1   33.3   11.1   22.2                  9                9.0
```

```
               FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
 LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
1500 METER LEVEL WINDS MORNING       APRIL.1979
 DIRECTION   ********* WIND SPEEDS METERS/SECOND ************************
              00.1  03.0  06.0  10.0  16.0  GREATER     ROW  SUMMARY
               TO    TO    TO    TO    TO    THAN    TOTAL   TOTAL  AVERAG
              02.9  05.9  09.9  15.9  25.0   25.0    COUNT  PERCENT  SPEED

      N                                                   0    0.0
    NNE                                                   0    0.0
     NE                                                   0    0.0
    ENE                                                   0    0.0
      E                                                   0    0.0
    ESE                                                   0    0.0
     SE                                                   0    0.0
    SSE                                                   0    0.0
      S                    9.0   9.0                      2   18.0     10.1
    SSW                          9.0                      1    9.0     15.1
     SW              9.0                                  1    9.0      3.3
    WSW                                                   0    0.0
      W                    9.0                            1    9.0      6.7
    WNW                    9.0         9.0                2   18.0     12.8
     NW              9.0         9.0   9.0                3   27.0     11.8
    NNW                    9.0                            1    9.0      6.0

   CALM                                                   0    0.0

COL. TOTALS         18.0  36.0  27.0  18.0               11                10.2
1500 METER LEVEL WINDS AFTERNOON     APRIL.1979
 DIRECTION   ********* WIND SPEEDS METERS/SECOND ************************
              00.1  03.0  06.0  10.0  16.0  GREATER     ROW  SUMMARY
               TO    TO    TO    TO    TO    THAN    TOTAL   TOTAL  AVERAG
              02.9  05.9  09.9  15.9  25.0   25.0    COUNT  PERCENT  SPEED

      N                   14.2                            1   14.2      6.0
    NNE                                                   0    0.0
     NE                                                   0    0.0
    ENE                                                   0    0.0
      E                                                   0    0.0
    ESE                                                   0    0.0
     SE             14.2                                  1   14.2      5.0
    SSE                                                   0    0.0
      S                                                   0    0.0
    SSW                                                   0    0.0
     SW                   28.5                            2   28.5      8.0
    WSW             14.2                                  1   14.2      4.8
      W                               14.2                1   14.2     22.0
    WNW                               14.2                1   14.2     19.1
     NW                                                   0    0.0
    NNW                                                   0    0.0

   CALM                                                   0    0.0

COL. TOTALS         28.4  42.7        28.4                7                10.4
```

```
             FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
CATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
0 METER LEVEL WINDS MORNING          APRIL,1979
IRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
            00.1    03.0    06.0    10.0    16.0   GREATER     ROW    SUMMARY
             TO      TO      TO      TO      TO     THAN      TOTAL    TOTAL   AVERAGE
            02.9    05.9    09.9    15.9    25.0    25.0      COUNT   PERCENT   SPEED

   N                                                            0       0.0
 NNE                                                            0       0.0
  NE                                                            0       0.0
 ENE                                                            0       0.0
   E                                                            0       0.0
 ESE                                                            0       0.0
  SE                                                            0       0.0
 SSE                                                            0       0.0
   S                                                            0       0.0
 SSW                                                            0       0.0
  SW                                12.5                        1      12.5      15.4
 WSW                                                            0       0.0
   W                        12.5                                1      12.5       6.8
 WNW                12.5    12.5                                2      25.0       6.0
  NW                        12.5    12.5    12.5                3      37.5      13.0
 NNW                        12.5                                1      12.5       7.8

CALM                                                            0       0.0

. TOTALS            12.5    50.0    25.0    12.5                8                10.1
0 METER LEVEL WINDS AFTERNOON        APRIL,1979
IRECTION   ********* WIND SPEEDS METERS/SECOND ***************************
            00.1    03.0    06.0    10.0    16.0   GREATER     ROW    SUMMARY
             TO      TO      TO      TO      TO     THAN      TOTAL    TOTAL   AVERAGE
            02.9    05.9    09.9    15.9    25.0    25.0      COUNT   PERCENT   SPEED

   N                                                            0       0.0
 NNE                                                            0       0.0
  NE                                20.0                        1      20.0      15.1
 ENE                                                            0       0.0
   E                                                            0       0.0
 ESE                                                            0       0.0
  SE                                                            0       0.0
 SSE                                                            0       0.0
   S                                                            0       0.0
 SSW                                20.0                        1      20.0      13.0
  SW                                20.0                        1      20.0      14.8
 WSW                                                            0       0.0
   W                                                            0       0.0
 WNW                20.0                    20.0                2      40.0      11.6
  NW                                                            0       0.0
 NNW                                                            0       0.0

CALM                                                            0       0.0

. TOTALS            20.0            60.0    20.0                5                13.2
```

```
                  FREQUENCY SUMMARY OF UPPER LEVEL WINDS (PERCENTAGES)
     LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)
    2500 METER LEVEL WINDS MORNING        APRIL,1979
      DIRECTION   ********* WIND SPEEDS METERS/SECOND ************************
                  00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                   TO     TO     TO     TO     TO     THAN     TOTAL   TOTAL  AVER
                  02.9   05.9   09.9   15.9   25.0    25.0     COUNT  PERCENT  SPE

         N                                                        0       0.0
       NNE                                                        0       0.0
        NE                                                        0       0.0
       ENE                                                        0       0.0
         E                                                        0       0.0
       ESE                                                        0       0.0
        SE                                                        0       0.0
       SSE                                                        0       0.0
         S                                                        0       0.0
       SSW                                                        0       0.0
        SW                                                        0       0.0
       WSW                                                        0       0.0
         W                                                        0       0.0
       WNW                                                        0       0.0
        NW                                                        0       0.0
       NNW                                                        0       0.0

      CALM                                                        0       0.0

    COL. TOTALS                                                   0
    2500 METER LEVEL WINDS AFTERNOON      APRIL,1979
      DIRECTION   ********* WIND SPEEDS METERS/SECOND ************************
                  00.1   03.0   06.0   10.0   16.0   GREATER      ROW   SUMMARY
                   TO     TO     TO     TO     TO     THAN     TOTAL   TOTAL  AVER
                  02.9   05.9   09.9   15.9   25.0    25.0     COUNT  PERCENT  SPE

         N                                                        0       0.0
       NNE                                                        0       0.0
        NE                                                        0       0.0
       ENE                                                        0       0.0
         E                                                        0       0.0
       ESE                                                        0       0.0
        SE                                                        0       0.0
       SSE                                                        0       0.0
         S                                                        0       0.0
       SSW                                                        0       0.0
        SW                                                        0       0.0
       WSW                                                        0       0.0
         W                                                        0       0.0
       WNW                                                        0       0.0
        NW                                                        0       0.0
       NNW                                                        0       0.0

      CALM                                                        0       0.0

    COL. TOTALS                                                   0
```

```
                  FREQUENCY SUMMARY OF INVERSIONS (PERCENTAGES)

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

                   MONTH OF      APRIL 1979     MORNING

         **************** INVERSION BASE HEIGHT (METERS) ***************
         SFC    001    101    251    501    751   1001   1501   2001   2501    >
KNESS           TO     TO     TO     TO     TO     TO     TO     TO     TO   THAN     TOTAL
TERS)           100    250    500    750   1000   1500   2000   2500   3000   3000

-100     9.0           9.0    9.0    9.0           9.0                                45.0

-250    22.7                 13.6    4.5           4.5    4.5                         49.8

-500     4.5                                                                           4.5

-750

L       36.2           9.0   22.6   13.5          13.5    4.5

 INVERSION                                                                             0.0

                                                   TOTAL NO. OF OCCURENCES             22

VERSION
TYPE

1                      4.5   13.6    9.0           9.0                                36.1

2        9.0           4.5    9.0    4.5           4.5    4.5                         36.0

3       18.1                                                                          18.1

4        9.0                                                                           9.0

5

                   MONTH OF      APRIL 1979     AFTERNOON

         **************** INVERSION BASE HEIGHT (METERS) ***************
         SFC    001    101    251    501    751   1001   1501   2001   2501    >
KNESS           TO     TO     TO     TO     TO     TO     TO     TO     TO   THAN     TOTAL
ETERS)          100    250    500    750   1000   1500   2000   2500   3000   3000

-100                   4.1   20.8    8.3    4.1    8.3    8.3                         53.9

-250                                 4.1    4.1    4.1    8.3                         20.6

-500                                               4.1                                 4.1

-750

L                      4.1   20.8   12.4    8.2   16.5   16.6

 INVERSION                                                                            20.0

                                                   TOTAL NO. OF OCCURENCES             19

VERSION
TYPE

1                            21.0   10.5   10.5   21.0   15.7                         78.7

2                      5.2    5.2    5.2                  5.2                         20.8

3

4

5
```

## FREQUENCY SUMMARY OF MIXING HEIGHTS

LOCATION: DEER LODGE CO - HIWAY JUNCTION - MET (MAPS)

MIXING HEIGHTS -FREQUENCY OF OCCURENCE FOR APRIL 1979

| MIXING HEIGHT (METERS) | MORNING OCCURENCES | AFTERNOON OCCURENCES |
|---|---|---|
| 0- 100 | 3 | 0 |
| 101- 250 | 3 | 0 |
| 251- 500 | 1 | 0 |
| 501- 750 | 5 | 5 |
| 751-1000 | 0 | 2 |
| 1001-1500 | 0 | 1 |
| >1500 | 0 | 6 |
| TOTAL | 12 | 14 |
| AVERAGE WIND SPEED THROUGH MIXED LAYER (M/SEC) | 4.9 | 7.3 |
| AVERAGE LAPSE RATE BELOW FIRST INVER. (DEG C /100M) | -00.69 | -01.04 |

# APPENDIX B

SITE: Highway Junction
DATE: 8-29-78
TIME 0625 MST

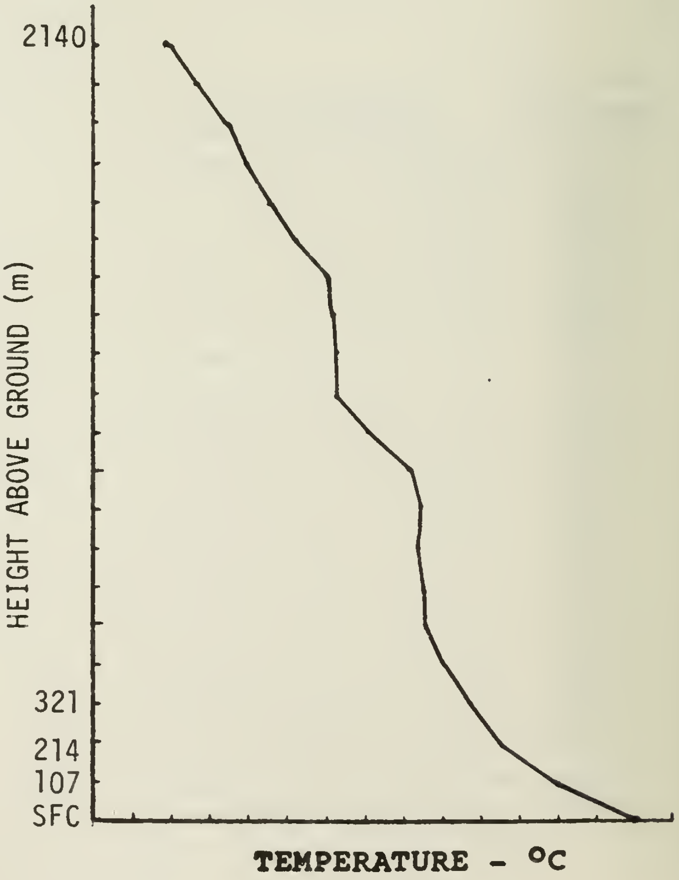
| LEVEL(AGL) (meters) | WIND SPEED (m/sec) | WIND DIRECTION (degrees) |
|---|---|---|
| SFC | 2.7 | 260 |
| 100 | 1.2 | 250 |
| 200 | 1.3 | 325 |
| 300 | 1.5 | 348 |
| 500 | 2.2 | 360 |
| 750 | 1.4 | 18 |
| 1000 | 0.7 | 88 |
| 1500 | 3.6 | 196 |

| LEVEL(AGL) (meters) | Temperature - $^{o}$C |
|---|---|
| 2140 | |
| 2033 | |
| 1926 | |
| 1819 | |
| 1712 | |
| 1605 | |
| 1498 | |
| 1391 | |
| 1284 | |
| 1177 | |
| 1070 | |
| 963 | |
| 856 | |
| 749 | |
| 642 | |
| 535 | |
| 428 | |
| 321 | |
| 214 | |
| 107 | |
| SFC | |

SITE: Highway Junction
DATE: 8-29-78
TIME 1400 MST

| LEVEL(AGL) (meters) | WIND SPEED (m/sec) | WIND DIRECTION (degrees) |
|---|---|---|
| SFC | 2.2 | 50 |
| 100 | 1.9 | 53 |
| 200 | 4.4 | 16 |
| 300 | 3.6 | 351 |
| 500 | 5.1 | 8 |
| 750 | 8.4 | 19 |
| 1000 | 2.8 | 179 |
| 1500 | 3.0 | 98 |

| LEVEL(AGL) (meters) | Temperature - °C |
|---|---|
| 2140 | 11.7 |
| 2033 | 12.5 |
| 1926 | 13.4 |
| 1819 | 13.9 |
| 1712 | 14.5 |
| 1605 | 15.2 |
| 1498 | 16.0 |
| 1391 | 16.2 |
| 1284 | 16.3 |
| 1177 | 16.2 |
| 1070 | 17.0 |
| 963 | 18.1 |
| 856 | 18.5 |
| 749 | 18.4 |
| 642 | 18.5 |
| 535 | 18.6 |
| 428 | 19.0 |
| 321 | 19.7 |
| 214 | 20.6 |
| 107 | 22.0 |
| SFC | 24.0 |



SITE: Highway Junction
DATE: 8-29-78
TIME: 1400 MST

## HOLZWORTH CLASSIFICATION SCHEME FOR INVERSIONS

| INV. BASE (M AGL) | THICKNESS (M) | TYPE | DT/DZ (C/100M) |
|---|---|---|---|
| 803.2 | 53.5 | 1 | 0.374 |
| 1177.7 | 53.5 | 1 | 0.375 |
| | | | |
| | | | |
| | | | |
| | | | |

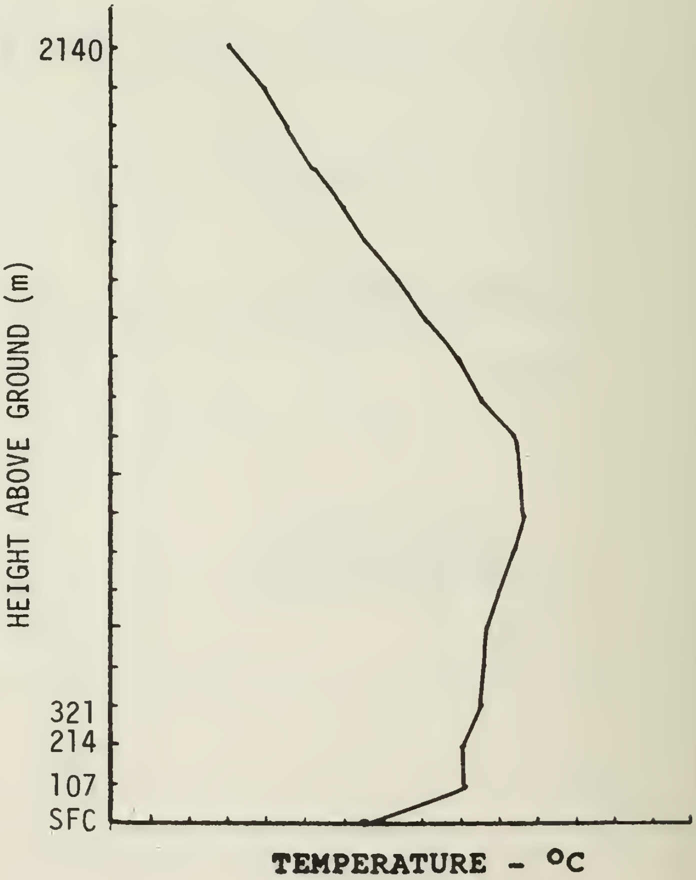
| MIXING HEIGHT (M) | AVERAGE WIND SPEED THRU MIXED LAYER (m/sec) |
|---|---|
| 541.0 | 4.2 |

| FIRST INVERSION LAPSE RATE (C/100M) | LAPSE RATE BELOW FIRST INVERSION (C/100M) |
|---|---|
| 0.374 | -0.710 |

SITE: Highway Junction
DATE: 8-30-78
TIME 0620 MST

| LEVEL(AGL) (meters) | WIND SPEED (m/sec) | WIND DIRECTION (degrees) |
|---|---|---|
| SFC | 2.9 | 270 |
| 100 | 1.9 | 273 |
| 200 | 2.0 | 329 |
| 300 | 1.0 | 304 |
| 500 | 2.8 | 235 |
| 750 | 1.4 | 233 |
| 1000 | 0.1 | 265 |
| 1500 | 4.0 | 255 |

| LEVEL(AGL) (meters) | Temperature - °C |
|---|---|
| 2140 | 4.0 |
| 2033 | 4.9 |
| 1926 | 5.6 |
| 1819 | 6.2 |
| 1712 | 6.9 |
| 1605 | 7.5 |
| 1498 | 8.3 |
| 1391 | 9.0 |
| 1284 | 9.8 |
| 1177 | 10.6 |
| 1070 | 11.3 |
| 963 | 11.5 |
| 856 | 11.6 |
| 749 | 11.3 |
| 642 | 11.0 |
| 535 | 10.6 |
| 428 | 10.5 |
| 321 | 10.4 |
| 214 | 10.1 |
| 107 | 10.1 |
| SFC | 7.5 |



SITE: Highway Junction
DATE: 8-30-78
TIME: 0625 MST

## HOLZWORTH CLASSIFICATION SCHEME FOR INVERSIONS

| INV. BASE (M AGL) | THICKNESS (M) | TYPE | DT/DZ (C/100M) |
|---|---|---|---|
| 0.0 | 160.5 | 3 | 1.682 |
| 214.0 | 160.5 | 1 | 0.249 |
| 481.6 | 160.5 | 1 | 0.311 |
| 695.6 | 214.0 | 1 | 0.327 |
| | | | |
| | | | |

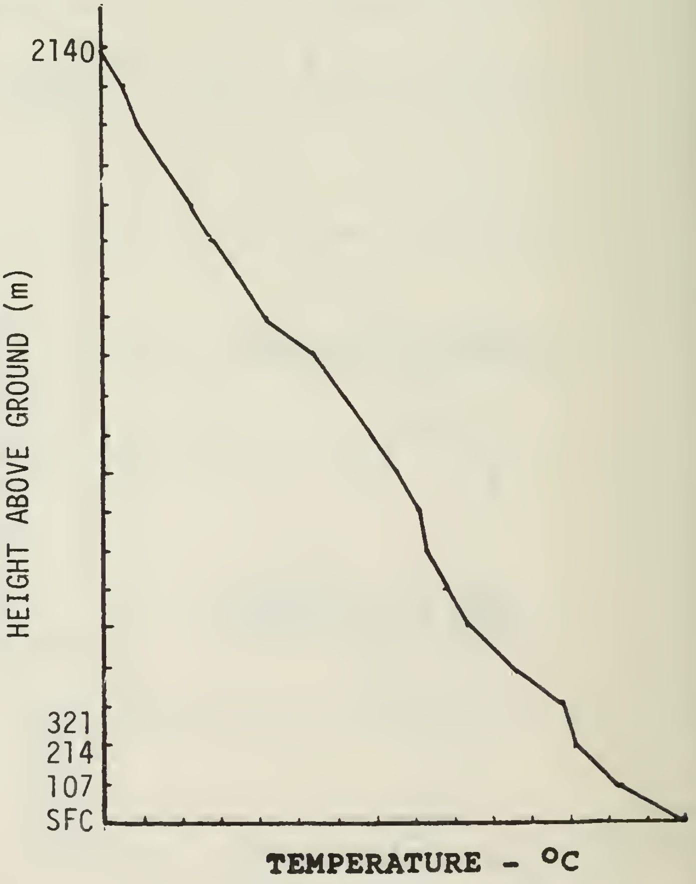
| MIXING HEIGHT (M) | AVERAGE WIND SPEED THRU MIXED LAYER (m/sec) |
|---|---|
| 80.2 | 1.9 |

| FIRST INVERSION LAPSE RATE (C/100M) | LAPSE RATE BELOW FIRST INVERSION (C/100M) |
|---|---|
| 1.682 | N/A |

SITE: Highway Junction
DATE: 8-30-78
TIME 1400 MST

| LEVEL(AGL) (meters) | WIND SPEED (m/sec) | WIND DIRECTION (degrees) |
|---|---|---|
| SFC | 2.9 | 50 |
| 100 | 5.8 | 44 |
| 200 | 3.3 | 36 |
| 300 | 5.0 | 35 |
| 500 | 3.2 | 15 |
| 750 | 8.0 | 101 |
| 1000 | 2.2 | 283 |
| 1500 | 1.8 | 247 |

| LEVEL(AGL) (meters) | Temperature - °C |
|---|---|
| 2140 | 10.8 |
| 2033 | 11.5 |
| 1926 | 11.8 |
| 1819 | 12.5 |
| 1712 | 13.3 |
| 1605 | 13.7 |
| 1498 | 14.5 |
| 1391 | 15.2 |
| 1284 | 16.3 |
| 1177 | 17.2 |
| 1070 | 17.8 |
| 963 | 18.6 |
| 856 | 19.1 |
| 749 | 19.3 |
| 642 | 19.7 |
| 535 | 20.3 |
| 428 | 21.5 |
| 321 | 22.8 |
| 214 | 23.2 |
| 107 | 24.3 |
| SFC | 26.0 |



SITE: Highway Junction
DATE: 8-30-78
TIME: 1400 MST

HOLZWORTH CLASSIFICATION SCHEME FOR INVERSIONS

| INV. BASE (M AGL) | THICKNESS (M) | TYPE | DT/DZ (C/100M) |
|---|---|---|---|
| 0.0 | 0.0 | 0 | 0.0 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

| MIXING HEIGHT (M) | AVERAGE WIND SPEED THRU MIXED LAYER (m/sec) |
|---|---|
| 319.4 | 4.7 |

| FIRST INVERSION LAPSE RATE (C/100M) | LAPSE RATE BELOW FIRST INVERSION (C/100M) |
|---|---|
| ---- | ----- |

## SMELTER EMISSIONS DATA

Date: August 29, 1978

| | NEW FLUE | | | ACID PLANT | | | MAIN STACK | | |
|---|---|---|---|---|---|---|---|---|---|
| Hour | Temp. degree F | $SO_2$ Conc. % | Flow Rate scfm x$10^4$ | Temp. degree F | $SO_2$ Conc. ppm | Flow Rate scfm x$10^4$ | Temp. degree F. 450 ft. | Flow Rate scfm x$10^4$ | Flow Rate scfm x$10^4$ |
| 01 | 199 | 4.17 | 11.09 | 165 | 883 | 7.99 | N/A | 37.39 | 33.57 |
| 02 | 197 | 2.15 | 13.37 | 161 | 436 | 8.26 | ↓ | West Treater Inlet<br>Values Recorded 1/24 hours | East Treater Inlet<br>Values recorded 1/24 hours |
| 03 | 199 | 1.42 | 12.68 | 175 | 272 | 8.51 | | | |
| 04 | 203 | 1.63 | 15.39 | 176 | 287 | 8.19 | | | |
| 05 | 203 | 3.82 | 16.25 | 176 | 867 | 7.94 | | | |
| 06 | 209 | 5.06 | 20.97 | 179 | 719 | 4.23 | | | |
| 07 | 220 | 5.25 | 27.82 | 139 | 107 | 2.64 | | | |
| 08 | 222 | 4.45 | 28.88 | 112 | 106 | 2.59 | | | |
| 09 | 217 | 5.19 | 30.08 | 110 | 244 | 4.78 | | | |
| 10 | 195 | 1.71 | 30.69 | 112 | 1314 | 4.98 | | | |
| 11 | 215 | 0.74 | 24.79 | 111 | 1400 | 5.54 | | | |
| 12 | 220 | 2.69 | 27.44 | 109 | 1400 | 7.00 | | | |
| 13 | 220 | 4.36 | 25.14 | 105 | 1400 | 6.21 | | | |
| 14 | 215 | 5.65 | 16.50 | 109 | 1392 | 5.20 | | | |
| 15 | 218 | 5.94 | 24.64 | 116 | 1379 | 6.04 | | | |
| 16 | 223 | 6.19 | 24.62 | 122 | 66 | 4.38 | | | |
| 17 | 217 | 3.69 | 17.42 | 163 | 1276 | 7.32 | | | |
| 18 | 217 | 1.17 | 19.62 | 164 | 247 | 7.99 | | | |
| 19 | 217 | 1.03 | 19.48 | 159 | 103 | 7.95 | | | |
| 20 | 216 | 1.52 | 19.62 | 168 | 161 | 7.97 | | | |
| 21 | 214 | 3.90 | 18.46 | 184 | 845 | 8.14 | | | |
| 22 | 216 | 0.59 | 19.56 | 165 | 80 | 7.41 | | | |
| 23 | 215 | 2.10 | 19.08 | 168 | 531 | 8.07 | | | |
| 24 | 212 | 4.21 | 18.62 | 190 | 1012 | 7.97 | | | |

Pounds of Copper Produced - 998,620

## SMELTER EMISSIONS DATA

Date: August 30, 1978

| | NEW FLUE | | | ACID PLANT | | | MAIN STACK | | |
|---|---|---|---|---|---|---|---|---|---|
| Hour | Temp. degree F | $SO_2$ Conc. % | Flow Rate scfm x$10^4$ | Temp. degree F | $SO_2$ Conc. ppm | Flow Rate scfm x$10^4$ | Temp. degree F. 450 ft. | Flow Rate scfm x$10^4$ | Flow Rate scfm x$10^4$ |
| 01 | 213 | 2.53 | 19.21 | 179 | 489 | 7.84 | N/A | 26.37 | 36.26 |
| 02 | 214 | 1.78 | 19.65 | 185 | 302 | 8.19 | | West Treater Inlet<br>Values Recorded 1/24 hours | East Treater Inlet<br>Values recorded 1/24 hours |
| 03 | 219 | .05 | 22.13 | 165 | 46 | 5.29 | | | |
| 04 | 222 | .65 | 23.32 | 142 | 62 | 4.84 | | | |
| 05 | 215 | 2.80 | 18.86 | 177 | 521 | 7.99 | | | |
| 06 | 212 | 3.63 | 18.99 | 177 | 814 | 7.86 | | | |
| 07 | 214 | 2.35 | 20.64 | 169 | 490 | 7.77 | | | |
| 08 | 200 | 0.71 | 9.35 | 168 | 143 | 6.75 | | | |
| 09 | 183 | 1.63 | 6.80 | 185 | 273 | 8.23 | | | |
| 10 | 192 | 1.89 | 14.15 | 195 | 342 | 8.33 | | | |
| 11 | 209 | 1.33 | 16.61 | 172 | 209 | 8.13 | | | |
| 12 | 211 | .42 | 15.92 | 165 | 67 | 8.02 | | | |
| 13 | 218 | .04 | 18.15 | 157 | 16 | 4.41 | | | |
| 14 | 219 | .31 | 18.69 | 130 | 27 | 1.65 | | | |
| 15 | 218 | .04 | 18.58 | 113 | 29 | 2.55 | | | |
| 16 | 213 | .52 | 17.48 | 100 | 15 | 4.16 | | | |
| 17 | 199 | 2.28 | 10.62 | 165 | 724 | 7.24 | | | |
| 18 | 200 | .06 | 12.18 | 183 | 2 | 6.95 | | | |
| 19 | 204 | .05 | 14.70 | 171 | 0 | 5.33 | | | |
| 20 | 211 | 1.47 | 17.83 | 135 | 0 | 4.26 | | | |
| 21 | 198 | 4.17 | 9.56 | 167 | 1046 | 7.54 | | | |
| 22 | 192 | 4.50 | 9.12 | 187 | 1243 | 7.93 | | | |
| 23 | 190 | 4.25 | 9.16 | 180 | 1088 | 7.88 | | | |
| 24 | 190 | 4.49 | 9.18 | 183 | 1112 | 7.97 | | | |

Pounds of Copper Produced - 963,740

Wind Direction (Degrees) Wind Speed (m/sec)

Date 08/29/78

$SO_2$ Concentration (ppm

| OUR | Wind Direction SITE: C-H | W-H | HJ | LS | Wind Speed C-H | W-H | HJ | L.S. | $SO_2$ C-H | HJ | Water off | MC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | 95 | 89 | 225 | 285 | 0.5 | 1.3 | 4.1 | 2.5 | .04 | .00 | .00 | .02 |
| 02 | 138 | 335 | 270 | 285 | 0.5 | 0.5 | 4.8 | 2.3 | .06 | .00 | .00 | .02 |
| 03 | 153 | 259 | 270 | 285 | 0.9 | 1.3 | 4.8 | 2.3 | .72 | .00 | .01 | |
| 04 | 184 | 241 | 270 | 285 | 0.9 | 2.7 | 4.5 | 2.5 | | .00 | .02 | |
| 05 | 142 | 232 | 255 | 285 | .05 | .09 | 3.9 | 2.7 | .96 | .00 | .02 | .02 |
| 06 | 169 | 318 | 255 | 285 | .09 | 1.3 | 3.4 | 2.7 | .19 | .00 | .01 | .06 |
| 07 | 127 | 49 | 255 | 285 | 0.5 | 0.9 | 3.9 | 2.5 | .08 | | .00 | .06 |
| 08 | 128 | 103 | 255 | 285 | 2.2 | 0.9 | 3.0 | 2.5 | .07 | | | .02 |
| 09 | 137 | 89 | 225 | 30 | 3.1 | 1.3 | 0.9 | 1.1 | .03 | .07 | .06 | .02 |
| 10 | 123 | 76 | 90 | 105 | 3.1 | 2.7 | 1.1 | 1.8 | .05 | .03 | .10 | .01 |
| 11 | 118 | 78 | 360 | 100 | 3.6 | 2.7 | 1.6 | 1.8 | .07 | .09 | .05 | .01 |
| 12 | 114 | 85 | 90 | 85 | 4.0 | 4.0 | 2.3 | 2.0 | .47 | .03 | .11 | .01 |
| 13 | 100 | 84 | 90 | 90 | 4.0 | 4.0 | 2.3 | 2.0 | .88 | .01 | .17 | .01 |
| 14 | 126 | 69 | 60 | 105 | 2.7 | 4.0 | 3.0 | 2.0 | .83 | .02 | .11 | .01 |
| 15 | 105 | 76 | 60 | 75 | 2.2 | 3.6 | 3.0 | 1.6 | .15 | .02 | .08 | .02 |
| 16 | 88 | 74 | 60 | 65 | 2.2 | 3.1 | 3.2 | 1.6 | .23 | .03 | .05 | .03 |
| 17 | 139 | 58 | 45 | 80 | 2.7 | 4.0 | 2.3 | 1.8 | .05 | .03 | .04 | .06 |
| 18 | 146 | 59 | 45 | 45 | 3.6 | 6.3 | 3.0 | 1.8 | .03 | .01 | .01 | .02 |
| 19 | 281 | 56 | 30 | 25 | 3.1 | 5.4 | 1.8 | 1.1 | .22 | .00 | .00 | .01 |
| 20 | 306 | 54 | 300 | 255 | 2.7 | 2.7 | 1.1 | 2.0 | .02 | .00 | .00 | .01 |
| 21 | 74 | 60 | 270 | 285 | 2.2 | 2.7 | 2.3 | 2.0 | .01 | .00 | .00 | .01 |
| 22 | 87 | 61 | 255 | 285 | 2.2 | 0.9 | 3.6 | 2.3 | .07 | .00 | .00 | .01 |
| 23 | 37 | 306 | 255 | 285 | 0.5 | 1.3 | 4.8 | 2.7 | .09 | .00 | .00 | .02 |
| 24 | 143 | 248 | 255 | 285 | 1.8 | 0.5 | 4.1 | 3.0 | .02 | .00 | .00 | .03 |

DATE 08/30/78

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | 155 | 239 | 255 | 285 | 4.5 | 3.6 | 5.0 | 2.7 | .03 | .00 | .00 | .02 |
| 02 | 173 | 246 | 255 | 285 | 3.1 | 3.6 | 4.8 | 3.0 | .04 | .00 | .00 | .02 |
| 03 | 206 | 251 | 255 | 285 | 3.6 | 6.7 | 4.5 | 2.7 | | .00 | .00 | |
| 04 | 211 | 251 | 255 | 285 | 3.1 | 8.0 | 4.5 | 2.5 | .02 | .00 | .00 | .00 |
| 05 | 201 | 248 | 270 | 285 | 0.5 | 5.8 | 3.6 | 2.5 | .02 | .00 | .00 | .00 |
| 06 | 209 | 252 | 270 | 280 | 0.5 | 4.9 | 3.6 | 2.5 | .05 | .00 | .00 | .00 |
| 07 | 215 | 251 | 270 | 285 | 0.0 | 5.4 | 3.2 | 3.4 | .10 | | | .01 |
| 08 | 166 | 241 | 270 | 290 | 1.3 | 3.1 | 1.8 | 2.3 | .06 | | .01 | .02 |
| 09 | 190 | 219 | 225 | 345 | 3.1 | 1.8 | 1.4 | 1.1 | .05 | .07 | .01 | .02 |
| 10 | 148 | 145 | 150 | 100 | 2.7 | 0.9 | 1.1 | 1.1 | .05 | .03 | .26 | .01 |
| 11 | 133 | 96 | 90 | 90 | 2.7 | 2.2 | 1.6 | 1.6 | .05 | .09 | .26 | |
| 12 | 106 | 77 | 60 | 90 | 3.1 | 4.0 | 2.3 | 2.0 | .17 | .03 | .17 | |
| 13 | 94 | 77 | 60 | 125 | 3.1 | 4.5 | 3.2 | 2.3 | .06 | .01 | .03 | |
| 14 | 101 | 70 | 60 | 75 | 4.0 | 5.8 | 3.6 | 2.7 | .05 | .01 | .03 | |
| 15 | 270 | 59 | 45 | 05 | 5.8 | 6.7 | 3.4 | 2.3 | .05 | .00 | .01 | |
| 16 | 264 | 283 | 360 | 280 | 6.7 | 8.5 | 3.2 | 3.0 | .03 | .00 | .00 | |
| 17 | 226 | 251 | 240 | 245 | 7.2 | 8.5 | 6.1 | 2.5 | .02 | .08 | .00 | |
| 18 | 278 | 303 | 285 | 280 | 2.7 | 5.8 | 2.5 | 1.6 | .01 | .00 | .00 | |
| 19 | 94 | 114 | 45 | 295 | 2.2 | 1.8 | 1.4 | 0.9 | .03 | .00 | .00 | .00 |
| 20 | 86 | 274 | 300 | 260 | 1.8 | 1.8 | 0.7 | 1.1 | .03 | .00 | .00 | .00 |
| 21 | 103 | 278 | 180 | 255 | 1.3 | 0.5 | 0.7 | 1.4 | .32 | .00 | .00 | .00 |
| 22 | 148 | 235 | 270 | 285 | 2.2 | 1.8 | 0.9 | 1.4 | .29 | .00 | .00 | .00 |
| 23 | 147 | 233 | 255 | 285 | 3.6 | 1.8 | 2.7 | 2.3 | .00 | .00 | .00 | .00 |
| 24 | 176 | 199 | 255 | 285 | 5.8 | 2.2 | 3.6 | 2.0 | .00 | .00 | .00 | .00 |

MC - Mill Creek Site
HJ - Highway Junction Site
LS - Lincoln School Site

C-H - C-Hill Site
W-H - Weather Hill Site
WO - Water Office

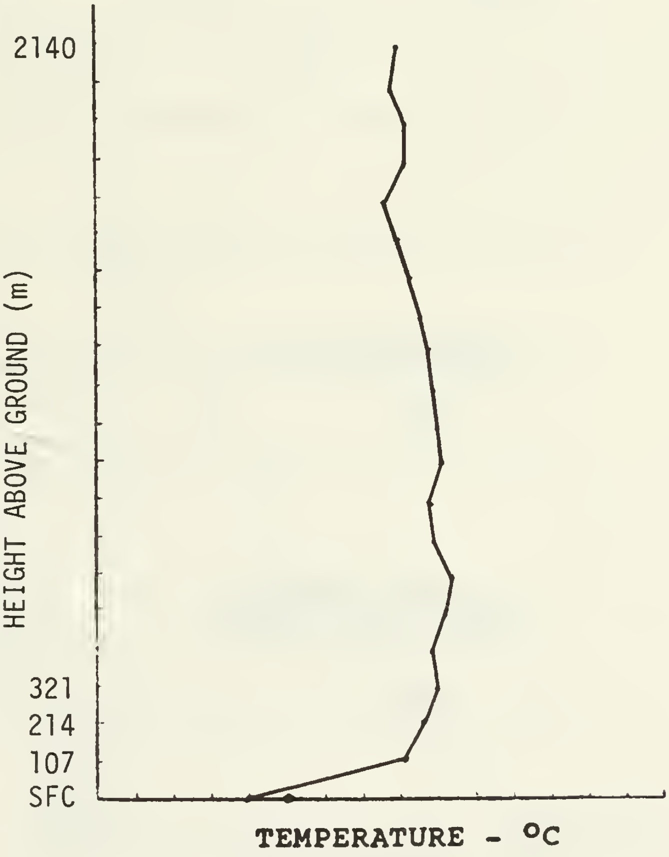
```
                        ANACONDA REDUCTION DEPARTMENT
                          ANACONDA, MONTANA 59711

DATE:  8/29/78                    DAILY REPORT                    JULIAN DAY: 241

                                 STACK MONITORS

      0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400  AVG

STATION #9    MAIN STACK

FLOW   172  207  197  241  254  331  447  465  481  475  395  442  404  265  396  399  279  315  312  314  295  313  305  297  333
ACFM  ,758 ,767 ,329 ,066 ,629 ,753 ,229 ,550 ,098 ,724 ,745 ,088 ,819 ,289 ,382 ,259 ,799 ,323 ,993 ,890 ,089 ,976 ,821 ,015 ,053
TEMP   199  197  199  203  203  209  220  222  217  195  215  220  220  215  218  223  217  217  217  216  214  216  215  212  212
PRES-1.24-1.20-1.17-1.21-1.24-1.33-1.44-1.43-1.42-1.30-1.29-1.37-1.37-1.27-1.36-1.34-1.28-1.25-1.24-1.19-1.19-1.19-1.23-1.19-1.28
BARO  2445 2445 2445 2444 2444 2444 2444 2444 2443 2442 2441 2439 2438 2436 2435 2433 2433 2432 2432 2432 2433 2433 2433 2433 2439
FLOW   110  133  126  153  162  209  278  288  300  306  247  274  251  165  246  246  174  196  194  196  184  195  190  186  208
SCFM  ,898 ,735 ,846 ,932 ,453 ,682 ,246 ,812 ,839 ,938 ,881 ,404 ,357 ,043 ,403 ,178 ,233 ,227 ,831 ,202 ,550 ,622 ,818 ,154 ,774

SO2 EMITTED
  %   4.17 2.15 1.42 1.63 3.82 5.06 5.25 4.45 5.19 1.71 0.74 2.69 4.36 5.65 5.94 6.19 3.69 1.17 1.03 1.52 3.90 0.59 2.10 4.21 3.28
PNDS    46   27   18   26   65  111       133         56   19        113   94             66   23   20   30   74   11   41   81   45
      ,847 ,901 ,724 ,137 ,388 ,173      ,531      ,117 ,376      ,958 ,461           ,571 ,691 ,891 ,996 ,493 ,571 ,972 ,496 ,393

PARTICULATE EMITTED
UG/M  29.8 22.9 19.8 34.7 21.9 17.6 41.2 27.6 21.7      19.9 16.5 13.4 14.3 12.7  6.6 14.6 15.4 12.5 12.3 16.4  8.3 13.0 10.8 18.3
PNDS  12.6 11.8  9.2 20.2 13.4 13.5 43.4 29.9 23.9      18.5 18.3 12.6  9.1 11.4  6.1  9.6 11.3  9.1  9.0 11.4  6.1  9.2  7.5 13.9

150 FT STACK TEMP
HIGH
 AVG
 LOW

850 FT STACK TEMP
HIGH
 AVG
 LOW



STATION #10     ACID PLANT STACK

FLOW   116  119  125  121  117   63   36   34   63   66   73   93   82   69   81   59  107  116  115  117  122  108  118  121   94
ACFM  ,443 ,604 ,988 ,540 ,767 ,147 ,891 ,514 ,576 ,467 ,953 ,128 ,150 ,248 ,427 ,692 ,205 ,811 ,402 ,485 ,851 ,761 ,967 ,442 ,175
TEMP   165  161  175  176  176  179  139  112  110  112  111  109  105  109  116  122  163  164  159  168  184  165  168  190  148
PRES-0.12-0.15-0.11-0.11-0.13-0.12-0.06-0.06-0.02-0.08-0.09-0.08-0.13-0.06-0.05-0.11-0.07-0.09-0.14-0.12-0.08-0.19-0.15-0.08-0.10
BARO  2467 2467 2466 2466 2466 2466 2466 2466 2465 2464 2463 2461 2459 2458 2457 2455 2455 2454 2454 2454 2455 2455 2455 2454 2460
FLOW    79   82   85   81   79   42   26   25   47   49   55   69   62   51   60   43   73   79   79   79   81   74   80   79   65
SCFM  ,867 ,558 ,059 ,894 ,354 ,273 ,435 ,894 ,813 ,791 ,413 ,981 ,103 ,959 ,368 ,768 ,214 ,874 ,509 ,735 ,403 ,089 ,742 ,719 ,686

SO2 EMITTED
PPM    883  436  272  287  867  719  107  106  244 1314 1400 1400 1400 1392 1379   66 1276  247  103  161  845   80  531 1012  688
PNDS   731  368  240  244  713  444   29   28  124  670  756       904  752  864   33  971  205   85  134  709   67  450  838  476
```

```
                                                THE ANACONDA COMPANY
                                           ANACONDA REDUCTION DEPARTMENT
                                              ANACONDA, MONTANA 59711

DATE:  8/30/78                                       DAILY REPORT                                         JULIAN DAY: 242

                                                     STACK MONITORS

     0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400  AVG

STATION #9    MAIN STACK

FLOW  306  314  357  378  302  303  330  146  103  220  264  254  293  302  300  280  166  191  232  285  150  141  142  142  246
ACFM ,933 ,422 ,054 ,119 ,642 ,218 ,675 ,729 ,804 ,093 ,461 ,024 ,137 ,545 ,495 ,595 ,790 ,457 ,726 ,538 ,037 ,951 ,275 ,410 ,150
TEMP  213  214  219  222  215  212  214  200  183  192  209  211  218  219  218  213  199  200  204  211  198  192  190  190  207
PRES-1.18-1.22-1.29-1.26-1.27-1.27-1.26-1.18-1.12-1.15-1.15-1.14-1.17-1.17-1.18-1.19-1.22-1.21-1.17-1.23-1.13-1.14-1.15-1.19-1.19
BARO 2432 2431 2431 2430 2430 2430 2430 2430 2429 2428 2427 2425 2424 2423 2421 2422 2425 2424 2422 2421 2420 2419 2418 2417 2425
FLOW  192  196  221  233  188  189  206   93   67  141  166  159  181  186  185  174  106  121  146  178   95   91   91   91  154
SCFM ,063 ,516 ,297 ,161 ,635 ,947 ,358 ,467 ,996 ,458 ,112 ,176 ,470 ,888 ,795 ,758 ,244 ,768 ,963 ,342 ,565 ,224 ,609 ,783 ,416

SO2 EMITTED
   % 2.53 1.78 0.05 0.65 2.80 3.63 2.35 0.71 1.63 1.89 1.33 0.42 0.04 0.31 0.04 0.52 2.28 0.06 0.05 1.47 4.17 4.50 4.25 4.49 1.72
PNDS   50   36    1   12   54   71   49    6   11   26   23    7    0    6    0    7   23    0    0   25   41   42   40   42   41
     ,240 ,427 ,245 ,952 ,961 ,881 ,845 ,886 ,864 ,686 ,015 ,134 ,720 ,069 ,851 ,346 ,783 ,793 ,678 ,122 ,411 ,884 ,463 ,861 ,967

PARTICULATE EMITTED
UG/M 12.8 13.1  7.3       8.5 13.4 10.4 25.0 56.5 35.3  7.7 15.7 10.3 13.0 14.6 10.9 19.8 10.8  7.6-10.0 ----- 23.6 20.3 21.3 16.8
PNDS  9.2  9.6  6.1       6.0  9.5  8.0  8.4 14.7 15.6  4.8  9.4  7.1  9.1 10.2  7.2  7.8  4.9  4.4  6.6       8.1  7.0  7.3  8.2

150 FT STACK TEMP
HIGH
 AVG
 LOW

450 FT STACK TEMP
HIGH
 AVG
 LOW


STATION #10     ACID PLANT STACK

FLOW  117  123   77   68  119  117  114   99  124  128  120  117   64   22   34   54  106  105   79   59  111  120  118  120   97
ACFM ,632 ,917 ,739 ,342 ,421 ,485 ,789 ,425 ,591 ,218 ,768 ,877 ,311 ,972 ,323 ,926 ,299 ,184 ,442 ,630 ,579 ,915 ,845 ,879 ,281
TEMP  179  185  165  142  177  177  169  168  185  195  172  165  157  130  113  100  165  183  171  135  167  187  180  183  165
PRES-0.13-0.14-0.14-0.15-0.09-0.08-0.06-0.02-0.02-0.08-0.14-0.11-0.10-0.06-0.11-0.20-0.21-0.06-0.11-0.16-0.08-0.08-0.11-0.12-0.11
BARO 2454 2453 2452 2451 2451 2451 2451 2451 2451 2450 2448 2447 2446 2444 2443 2443 2447 2446 2444 2443 2442 2441 2439 2439 2447
FLOW   78   81   52   48   79   78   77   67   82   83   81   80   44   16   25   41   72   69   53   42   75   79   78   79   65
SCFM ,448 ,883 ,910 ,380 ,906 ,607 ,728 ,492 ,317 ,352 ,316 ,169 ,064 ,520 ,475 ,630 ,372 ,547 ,345 ,559 ,445 ,309 ,754 ,687 ,607

SO2 EMITTED
PPM   489  307   46   62  521  814  490  143  273  342  209   67   16   27   29   15  724    2    0 -  0 1046 1243 1088 1112  424
PNDS  399  256   26   40  435  665  396  105  234  296  176   56    8    4    8    8  553                817       891  922  344
```

SITE: Highway Junction
DATE: 10-5-78
TIME 0710 MST

| LEVEL(AGL) (meters) | WIND SPEED (m/sec) | WIND DIRECTION (degrees) |
|---|---|---|
| SFC | 2.7 | 240 |
| 100 | 2.6 | 208 |
| 200 | 2.6 | 236 |
| 300 | 1.1 | 166 |
| 500 | 2.2 | 205 |
| 750 | 6.4 | 160 |
| 1000 | 4.3 | 183 |
| 1500 | 3.2 | 222 |

| LEVEL(AGL) (meters) | Temperature - °C |
|---|---|
| 2140 | 5.0 |
| 2033 | 5.1 |
| 1926 | 5.3 |
| 1819 | 5.2 |
| 1712 | 4.5 |
| 1605 | 4.9 |
| 1498 | 5.2 |
| 1391 | 5.5 |
| 1284 | 5.7 |
| 1177 | 5.8 |
| 1070 | 5.9 |
| 963 | 6.0 |
| 856 | 5.8 |
| 749 | 5.8 |
| 642 | 6.3 |
| 535 | 6.2 |
| 428 | 5.8 |
| 321 | 6.0 |
| 214 | 5.5 |
| 107 | 5.1 |
| SFC | 1.0 |



SITE: Highway Junction
DATE: 10-5-78
TIME: 0710 MST

## HOLZWORTH CLASSIFICATION SCHEME FOR INVERSIONS

| INV. BASE (M AGL) | THICKNESS (M) | TYPE | DT/DZ (C/100M) |
|---|---|---|---|
| 0.0 | 285.4 | 3 | 1.787 |
| 428.0 | 214.0 | 1 | 0.234 |
| 927.4 | 71.3 | 1 | 0.280 |
| 1712.2 | 214.0 | 1 | 0.374 |
| 1997.6 | 41.3 | 1 | 0.140 |
|  |  |  |  |

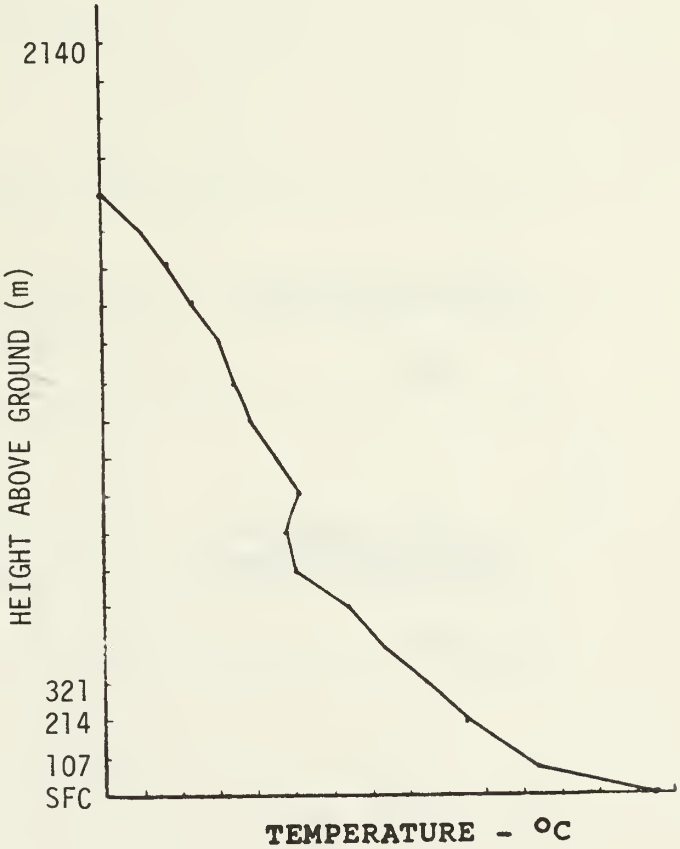
| MIXING HEIGHT (M) | AVERAGE WIND SPEED THRU MIXED LAYER (m/sec) |
|---|---|
| 53.3 | 4.7 |

| FIRST INVERSION LAPSE RATE (C/100M) | LAPSE RATE BELOW FIRST INVERSION (C/100M) |
|---|---|
| 1.787 | ----- |

SITE: Highway Junction
DATE: 10-5-78
TIME 1420 MST

| LEVEL(AGL) (meters) | WIND SPEED (m/sec) | WIND DIRECTION (degrees) |
|---|---|---|
| SFC | 0.9 | 30 |
| 100 | 1.2 | 22 |
| 200 | 2.0 | 46 |
| 300 | 2.4 | 43 |
| 500 | 2.6 | 96 |
| 750 | 1.7 | 180 |
| 1000 | 2.2 | 228 |
| 1500 | 3.2 | 252 |

| LEVEL(AGL) (meters) | Temperature - °C |
|---|---|
| 2140 | -0.5 |
| 2033 | 0.2 |
| 1926 | 0.5 |
| 1819 | 1.2 |
| 1712 | 2.0 |
| 1605 | 3.0 |
| 1498 | 3.5 |
| 1391 | 4.2 |
| 1284 | 5.0 |
| 1177 | 5.3 |
| 1070 | 5.7 |
| 963 | 6.5 |
| 856 | 7.0 |
| 749 | 6.7 |
| 642 | 7.0 |
| 535 | 8.3 |
| 428 | 9.2 |
| 321 | 10.3 |
| 214 | 11.5 |
| 107 | 13.3 |
| SFC | 16.5 |



SITE: Highway Junction
DATE: 10-5-78
TIME: 1420 MST

## HOLZWORTH CLASSIFICATION SCHEME FOR INVERSIONS

| INV. BASE (M AGL) | THICKNESS (M) | TYPE | DT/DZ (C/100M) |
|---|---|---|---|
| 695.6 | 107.0 | 1 | 0.467 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

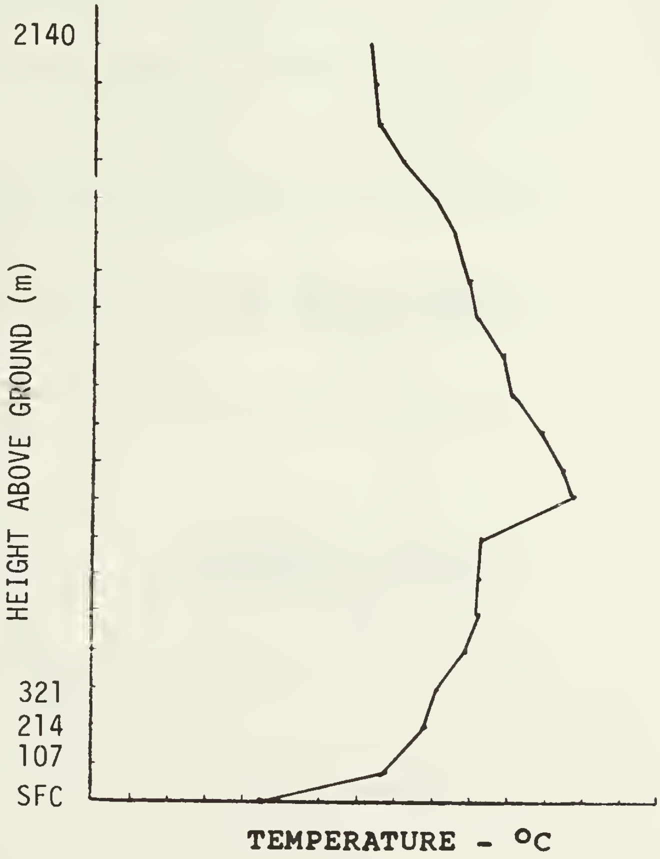
| MIXING HEIGHT (M) | AVERAGE WIND SPEED THRU MIXED LAYER (m/sec) |
|---|---|
| 1085.9 | 2.0 |

| FIRST INVERSION LAPSE RATE (C/100M) | LAPSE RATE BELOW FIRST INVERSION (C/100M) |
|---|---|
| 0.467 | - 1.438 |

SITE: Highway Junction
DATE: 10-6-78
TIME 0715 MST

| LEVEL(AGL) (meters) | WIND SPEED (m/sec) | WIND DIRECTION (degrees) |
|---|---|---|
| SFC | 1.8 | 230 |
| 100 | 4.7 | 233 |
| 200 | 3.9 | 215 |
| 300 | 4.2 | 229 |
| 500 | 2.2 | 227 |
| 750 | 2.8 | 244 |
| 1000 | 2.5 | 266 |
| 1500 | 5.6 | 267 |

| LEVEL(AGL) (meters) | Temperature - °C |
|---|---|
| 2140 | 6.3 |
| 2033 | 6.4 |
| 1926 | 6.5 |
| 1819 | 7.0 |
| 1712 | 7.8 |
| 1605 | 8.4 |
| 1498 | 9.1 |
| 1391 | 9.4 |
| 1284 | 9.8 |
| 1177 | 10.2 |
| 1070 | 11.0 |
| 963 | 11.5 |
| 856 | 11.8 |
| 749 | 9.5 |
| 642 | 9.4 |
| 535 | 9.3 |
| 428 | 8.9 |
| 321 | 8.1 |
| 214 | 7.8 |
| 107 | 6.7 |
| SFC | 3.5 |



SITE: Highway Junction
DATE: 10-6-78
TIME: 0715 MST

## HOLZWORTH CLASSIFICATION SCHEME FOR INVERSIONS

| INV. BASE (M AGL) | THICKNESS (M) | TYPE | DT/DZ (C/100M) |
|---|---|---|---|
| 0.0 | 214.0 | 3 | 2.009 |
| 267.5 | 321.0 | 2 | 0.498 |
| 642.1 | 160.5 | 3 | 1.495 |
| | | | |
| | | | |
| | | | |

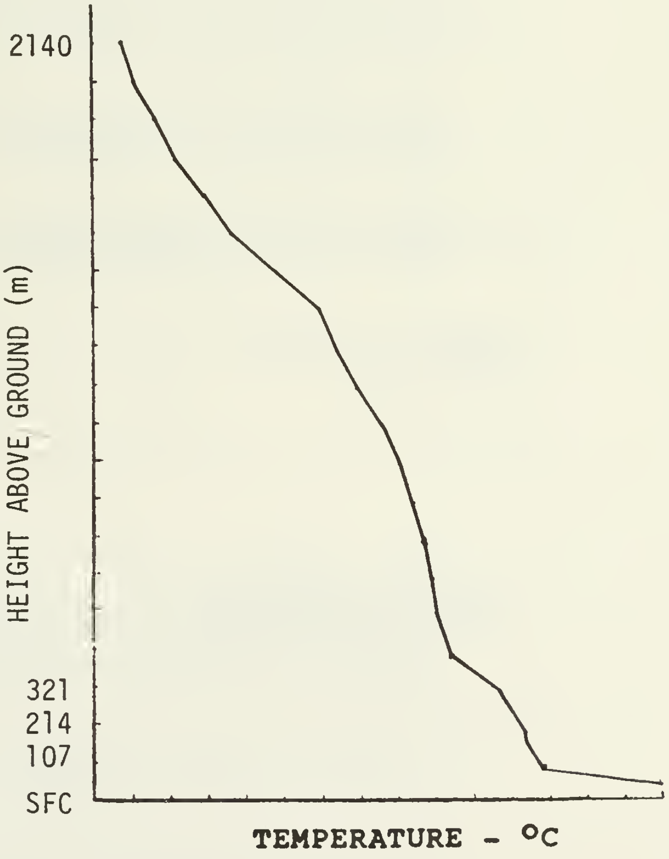
| MIXING HEIGHT (M) | AVERAGE WIND SPEED THRU MIXED LAYER (m/sec) |
|---|---|
| 82.2 | 4.2 |

| FIRST INVERSION LAPSE RATE (C/100M) | LAPSE RATE BELOW FIRST INVERSION (C/100M) |
|---|---|
| 2.009 | ----- |

SITE: Highway Junction
DATE: 10-6-78
TIME 1400 MST

| LEVEL(AGL) (meters) | WIND SPEED (m/sec) | WIND DIRECTION (degrees) |
|---|---|---|
| SFC | 1.8 | 210 |
| 100 | 7.7 | 33 |
| 200 | 6.4 | 30 |
| 300 | 1.5 | 16 |
| 500 | | |
| 750 | | |
| 1000 | | |

| LEVEL(AGL) (meters) | Temperature - °C |
|---|---|
| 2140 | 1.8 |
| 2033 | 2.1 |
| 1926 | 2.5 |
| 1819 | 3.0 |
| 1712 | 3.8 |
| 1605 | 4.6 |
| 1498 | 5.6 |
| 1391 | 6.8 |
| 1284 | 7.4 |
| 1177 | 7.9 |
| 1070 | 8.4 |
| 963 | 9.0 |
| 856 | 9.5 |
| 749 | 9.8 |
| 642 | 10.0 |
| 535 | 10.0 |
| 428 | 10.3 |
| 321 | 11.7 |
| 214 | 11.3 |
| 107 | 11.8 |
| SFC | 19.0 |



SITE: Highway Junction
DATE: 10-6-78
TIME: 1400 MST

## HOLZWORTH CLASSIFICATION SCHEME FOR INVERSIONS

| INV. BASE (M AGL) | THICKNESS (M) | TYPE | DT/DZ (C/100M) |
|---|---|---|---|
| 481.6 | 1.7.0 | 1 | 0.280 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

| MIXING HEIGHT (M) | AVERAGE WIND SPEED THRU MIXED LAYER (m/sec) |
|---|---|
| 1054.0 | 4.7 |

| FIRST INVERSION LAPSE RATE (C/100M) | LAPSE RATE BELOW FIRST INVERSION (C/100M) |
|---|---|
| 0.280 | -1.890 |

## SMELTER EMISSIONS DATA

Date: October 5, 1978

| | NEW FLUE | | | ACID PLANT | | | MAIN STACK | | |
|---|---|---|---|---|---|---|---|---|---|
| Hour | Temp. degree F | $SO_2$ Conc. % | Flow Rate scfm x$10^4$ | Temp. degree F | $SO_2$ Conc. ppm | Flow Rate scfm x$10^4$ | Temp. degree F. 450 ft. | Flow Rate scfm x$10^4$ | Flow Rate scfm x$10^4$ |
| 01 | 202 | 2.39 | 17.98 | 176 | 608 | 4.72 | | N/A | N/A |
| 02 | 199 | 2.46 | 17.49 | 168 | 538 | 4.67 | | West Treater Inlet<br>Values Recorded 1/24 hours | East Treater Inlet<br>Values recorded 1/24 hours |
| 03 | 200 | 2.64 | 18.89 | 169 | 574 | 4.75 | | | |
| 04 | 202 | 3.24 | 19.45 | 177 | 609 | 4.77 | | | |
| 05 | 201 | 3.71 | 18.49 | 183 | 592 | 4.80 | | | |
| 06 | 200 | 2.90 | 17.62 | 181 | 433 | 4.91 | | | |
| 07 | 199 | 3.00 | 18.11 | 173 | 445 | 4.86 | | | |
| 08 | 196 | | 15.02 | 172 | 279 | 4.97 | | | |
| 09 | 202 | 2.98 | 20.55 | 160 | 376 | 4.93 | | | |
| 10 | 205 | 3.65 | 21.31 | 150 | 401 | 3.64 | | | |
| 11 | 210 | 4.42 | 23.76 | 153 | 526 | 4.45 | | | |
| 12 | 207 | 3.60 | 20.67 | 182 | 454 | 4.89 | | | |
| 13 | 204 | 2.92 | 17.52 | 171 | 299 | 4.88 | 133 | | |
| 14 | 207 | 3.88 | 21.38 | 170 | 435 | 4.42 | 132 | | |
| 15 | 210 | 3.87 | 21.57 | 175 | 487 | 4.94 | 138 | | |
| 16 | 211 | 2.89 | 20.85 | 177 | 5.9 | 5.00 | 137 | | |
| 17 | 208 | 2.50 | 18.98 | 171 | 393 | 4.92 | 138 | | |
| 18 | 208 | 3.02 | 20.62 | 175 | 618 | 4.88 | 146 | | |
| 19 | 207 | 3.03 | 19.15 | 177 | 490 | 4.90 | 160 | | |
| 20 | 205 | 2.29 | 19.35 | 169 | 240 | 5.08 | 153 | | |
| 21 | 203 | 2.33 | 17.41 | 166 | 376 | 5.07 | 143 | | |
| 22 | 204 | 2.49 | 18.37 | 174 | 446 | 5.19 | 139 | | |
| 23 | 203 | 2.67 | 20.20 | 176 | 470 | 5.16 | 141 | | |
| 24 | 206 | 3.15 | 21.29 | 181 | 659 | 5.01 | 148 | | |

Pounds of Copper Produced - 849,180

## SMELTER EMISSIONS DATA

Date: October 6, 1979

|  | NEW FLUE |  |  | ACID PLANT |  |  | MAIN STACK |  |  |
|---|---|---|---|---|---|---|---|---|---|
| Hour | Temp. degree F | $SO_2$ Conc. % | Flow Rate scfm x$10^4$ | Temp. degree F | $SO_2$ Conc. ppm | Flow Rate scfm x$10^4$ | Temp. degree F. 450 ft. | Flow Rate scfm x$10^4$ | Flow Rate scfm x$10^4$ |
| 01 | 205 | 3.16 | 21.10 | 184 | 682 | 4.88 | 151 | 29.80 | 41.62 |
| 02 | 207 | 3.21 | 21.37 | 187 | 769 | 4.93 | 154 | West Treater Inlet<br>Values Recorded 1/24 hours | East Treater Inlet<br>Values recorded 1/24 hours |
| 03 | 204 | 2.93 | 20.40 | 183 | 669 | 4.99 | 155 |  |  |
| 04 | 205 | 2.43 | 20.72 |  | 539 | 0.00 | 153 |  |  |
| 05 | 203 | 2.57 | 19.07 | 172 | 526 | 4.87 | 144 |  |  |
| 06 | 202 | 2.63 | 19.14 |  | 540 | 0.00 | 140 |  |  |
| 07 | 204 | 2.49 | 21.19 | 173 | 501 | 5.24 | 143 |  |  |
| 08 | 196 | 2.20 | 21.14 | 189 | 528 | 8.20 | 138 |  |  |
| 09 | 196 | 2.85 | 21.62 |  | 593 | 0.00 |  |  |  |
| 10 | 193 | 2.79 | 20.92 | 186 | 638 | 8.35 |  |  |  |
| 11 | 195 | 2.76 | 19.43 | 181 | 442 | 8.27 | 140 |  |  |
| 12 | 195 | 3.20 | 19.41 | 175 | 584 | 8.15 | 140 |  |  |
| 13 | 197 | 3.50 | 19.31 | 179 | 686 | 8.20 | 142 |  |  |
| 14 | 199 | 4.08 | 16.78 | 186 | 885 | 8.07 | 139 |  |  |
| 15 | 204 | 3.07 | 16.67 | 185 | 575 | 8.13 | 139 |  |  |
| 16 | 203 | 3.25 | 16.15 | 178 | 533 | 8.06 | 142 |  |  |
| 17 | 202 | 2.99 | 14.84 | 181 | 476 | 8.00 | 142 |  |  |
| 18 | 204 | 3.68 | 17.64 | 181 | 686 | 8.02 | 143 |  |  |
| 19 | 203 | 3.32 | 15.81 | 183 | 588 | 8.08 | 149 |  |  |
| 20 | 201 | 3.42 | 16.70 | 176 | 521 | 7.99 | 147 |  |  |
| 21 | 201 | 3.52 | 16.29 | 176 | 663 | 8.10 | 143 |  |  |
| 22 | 201 | 4.37 | 16.30 | 181 | 875 | 8.02 | 143 |  |  |
| 23 | 202 | 4.73 | 18.06 | 187 | 1078 | 8.07 | 146 |  |  |
| 24 | 200 | 3.75 | 15.60 | 186 | 685 | 8.10 | 152 |  |  |

Pounds of Copper Produced - 735,920

Wind Direction (Degrees) SITE: | Wind Speed (m/sec) | Date 10/05/78 SO$_2$ Concentration (ppm)

| Wind Direction (Degrees) | | | | Wind Speed (m/sec) | | | | SO$_2$ Concentration (ppm) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| L.S. | H.J. | C-H | W-H | L.S. | H.J. | C-H | W-H | L.S. | H.J. | C-H | M.C. |
| 290 | 255 | | 29 | 3.0 | 3.6 | 0.5 | 0.0 | .02 | .00 | .00 | .06 |
| 295 | 255 | | 61 | 2.5 | 3.9 | 0.5 | 0.0 | .03 | .00 | .02 | .12 |
| 295 | 255 | | 237 | 2.5 | 3.4 | 1.3 | 0.9 | .07 | .00 | .13 | .10 |
| 285 | 255 | | 229 | 2.3 | 3.6 | 1.3 | 2.2 | .06 | .00 | .60 | .08 |
| 280 | 255 | | 199 | 2.5 | 3.2 | 2.2 | 1.3 | .11 | .01 | .52 | |
| 290 | 255 | | 226 | 2.5 | 3.6 | 2.2 | 1.3 | .11 | .01 | .01 | |
| 285 | 240 | | 244 | 2.5 | 3.4 | 2.7 | 2.7 | .12 | .03 | .10 | .06 |
| 290 | 255 | | 247 | 2.7 | 3.0 | 1.8 | 3.1 | .11 | .04 | .17 | .06 |
| 290 | 165 | | 248 | 2.3 | 1.8 | 1.3 | 2.2 | .18 | .07 | .13 | .06 |
| 60 | 180 | sensor failure | 233 | .09 | 1.6 | 0.9 | 0.5 | .47 | .07 | .39 | .02 |
| 120 | 150 | | 148 | 1.1 | 1.1 | 2.7 | 1.3 | .45 | .23 | .11 | .06 |
| 135 | 120 | | 100 | 1.6 | 1.6 | 3.6 | 3.1 | 1.00 | .17 | .11 | .02 |
| 70 | 75 | | 103 | 2.0 | 1.1 | 3.6 | 3.6 | .70 | .01 | .00 | .01 |
| 80 | 90 | | 91 | 2.0 | 2.0 | 3.6 | 3.1 | .52 | .00 | .27 | .00 |
| 120 | 60 | | 75 | 2.0 | 2.3 | 2.7 | 2.7 | .23 | .04 | 1.07 | .02 |
| 90 | 30 | | 70 | 1.6 | 2.0 | 2.2 | 3.1 | .22 | | .86 | .06 |
| 70 | 45 | | 63 | 1.6 | 2.5 | 2.2 | 3.6 | .06 | | .21 | .06 |
| 100 | 60 | | 64 | 1.6 | 1.6 | 1.8 | 3.6 | .01 | .01 | .02 | .02 |
| 195 | 300 | | 36 | 1.4 | 0.9 | 1.8 | 3.1 | .06 | .01 | .00 | .06 |
| 285 | 270 | | 64 | 2.0 | 2.7 | 1.3 | 1.8 | .11 | .04 | .00 | .18 |
| 285 | 255 | | 257 | 2.3 | 4.3 | 1.3 | 0.0 | .09 | .06 | .00 | .10 |
| 290 | 255 | | 239 | 2.7 | 4.5 | 0.5 | 0.5 | .08 | .06 | .00 | .12 |
| 290 | 255 | | 233 | 3.0 | 4.5 | 0.9 | 2.2 | .07 | .05 | .49 | .08 |
| 290 | 255 | | 240 | 3.0 | 5.2 | 1.3 | 1.8 | .11 | .05 | .15 | .14 |

DATE 10/06/78

| Wind Direction (Degrees) | | | | Wind Speed (m/sec) | | | | SO$_2$ Concentration (ppm) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| L.S. | H.J. | C-H | W-H | L.S. | H.J. | C-H | W-H | L.S. | H.J. | C-H | M.C. |
| 290 | 255 | | 244 | 3.4 | 4.5 | 2.2 | 4.0 | .16 | .04 | | .26 |
| 295 | 255 | | 247 | 3.2 | 4.5 | 2.2 | 4.5 | .38 | .06 | .12 | .16 |
| 295 | 240 | | 244 | 3.2 | 3.9 | 2.2 | 6.3 | .38 | .09 | .23 | .10 |
| 285 | 240 | | 248 | 2.7 | 3.2 | 1.3 | 4.5 | .28 | .08 | 1.05 | .97 |
| 285 | 255 | | 246 | 2.7 | 3.4 | 0.5 | 3.8 | .23 | .09 | .50 | |
| 285 | 255 | | 248 | 2.7 | 3.0 | 0.5 | 8.0 | .22 | .11 | .09 | .04 |
| 285 | 255 | | 249 | 2.5 | 2.7 | .05 | 9.8 | .24 | .09 | .01 | .05 |
| 285 | 240 | | 249 | 2.5 | 2.5 | 0.0 | 8.5 | .16 | | .22 | .05 |
| 290 | 225 | | 245 | 1.6 | 1.8 | 0.9 | 5.8 | .18 | | .04 | .03 |
| 165 | 120 | | 238 | 0.9 | 1.1 | 2.7 | 4.0 | | .01 | .04 | .02 |
| 135 | 120 | | 226 | 1.1 | 0.9 | 4.0 | 3.1 | | .03 | .05 | .02 |
| 125 | 135 | | 191 | 1.8 | 1.1 | 3.6 | 0.9 | .22 | .07 | .04 | .02 |
| 95 | 45 | | 116 | 1.8 | 2.0 | 4.5 | 1.3 | .21 | .01 | .03 | .02 |
| 95 | 45 | | 67 | 2.3 | 3.0 | 2.2 | 3.1 | .25 | .03 | .04 | .01 |
| 95 | 45 | | 67 | 2.3 | 3.0 | 2.2 | 3.1 | .80 | .25 | .40 | .12 |
| 95 | 45 | | 59 | 3.0 | 3.2 | 0.9 | 4.0 | .26 | | .31 | .24 |
| 110 | 60 | | 63 | 2.3 | 3.0 | 1.3 | 3.1 | .09 | .06 | .15 | .08 |
| 170 | 15 | | 59 | 1.6 | 0.9 | 0.9 | 2.2 | .08 | .06 | .10 | .05 |
| 265 | 270 | | 28 | 1.6 | 1.4 | 1.8 | 0.9 | .12 | .07 | .04 | .14 |
| 285 | 255 | | 255 | 2.5 | 4.1 | 1.3 | 0.9 | .12 | .08 | .05 | .17 |
| 285 | 255 | | 289 | 3.0 | 4.3 | 0.0 | 1.8 | .08 | .06 | .02 | .18 |
| 285 | 255 | | 244 | 3.0 | 4.8 | 0.5 | 2.2 | .06 | .04 | .53 | .16 |
| 285 | 255 | | 238 | 2.7 | 5.0 | 1.8 | 3.6 | .05 | .04 | .14 | .14 |
| 285 | 255 | | 245 | 3.2 | 5.0 | 3.6 | 7.6 | .06 | .03 | .13 | .16 |

MC - Mill Creek Site
HJ - Highway Junction Site
LS - Lincoln School Site

C-H - C-Hill Site
W-H - Weather Hill Site
WO - Water Office

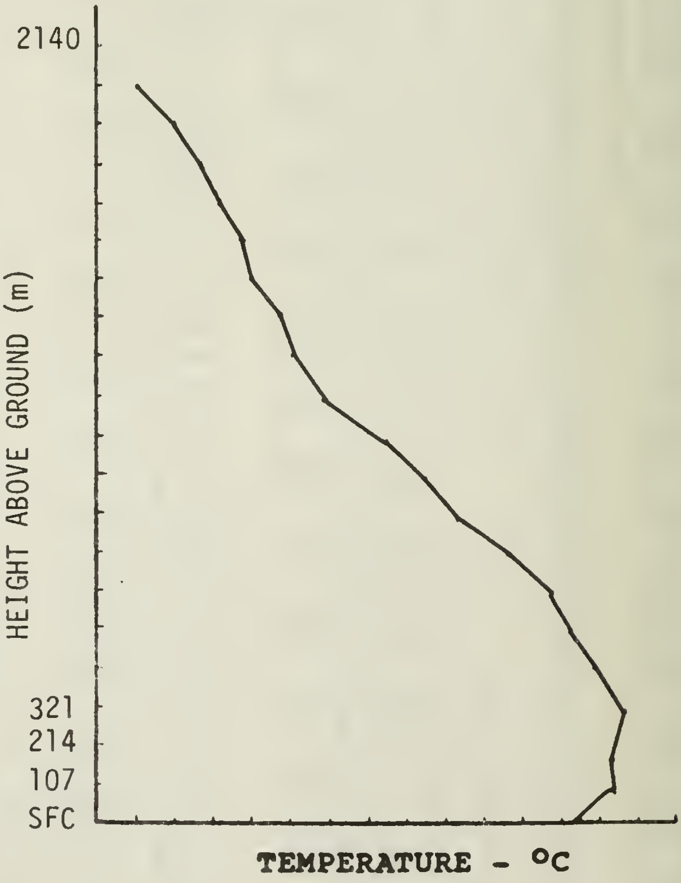
```
                                        THE ANACONDA COMPANY
                                  ANACONDA REDUCTION DEPARTMENT
                                     ANACONDA, MONTANA 59711

DATE: 10/ 5/78                               DAILY REPORT                                   JULIAN DAY: 278

                                            STACK MONITORS

     0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400  AVG

STATION #9    MAIN STACK

FLOW  283  274  297  307  291  277  284  234  324  337  379  328  277  340  344  333  302  328  304  307  275  290  319  337  308
ACFM ,794 ,610 ,272 ,102 ,299 ,085 ,487 ,865 ,065 ,832 ,158 ,958 ,643 ,104 ,996 ,880 ,631 ,984 ,912 ,133 ,186 ,840 ,730 ,979 ,456
TEMP  202  199  200  202  201  200  199  196  202  205  210  207  204  207  210  211  208  208  207  205  203  204  203  206  204
PRES-1.80-1.81-1.82-1.82-1.85-1.83-1.82-1.82-1.82-1.80-1.75-1.72-1.67-1.66-1.64-1.63-1.65-1.67-1.68-1.66-1.64-1.63-1.66-1.67-1.73
BARO 2427 2427 2427 2427 2427 2427 2428 2428 2428 2428 2427 2426 2424 2423 2422 2422 2422 2422 2422 2423 2424 2424 2424 2424 2425
FLOW  179  174  198  194  184  176  181  150  205  213  237  206  175  213  215  208  189  206  191  193  174  183  202  212  194
SCFM ,827 ,891 ,882 ,512 ,922 ,151 ,114 ,197 ,458 ,133 ,635 ,703 ,198 ,861 ,704 ,580 ,898 ,285 ,544 ,562 ,083 ,705 ,018 ,871 ,661

SO2 EMITTED
   % 2.39 2.46 2.64 3.24 3.71 2.90 3.00      2.98 3.65 4.42 3.60 2.92 3.88 3.87 2.89 2.50 3.02 3.03 2.29 2.33 2.49 2.67 3.15 3.06
PNUS   45   45   52   65   71   53   56        64   80  109   76   53   86   86   63   49   65   65   45   42   47   56   69   58
     ,583 ,346 ,045 ,536 ,406 ,633 ,685      ,723 ,032 ,064 ,221 ,410 ,256 ,948 ,923 ,503 ,130 ,182 ,522 ,343 ,845 ,498 ,847 ,064

PARTICULATE EMITTED
UG/M
PNUS

150 FT STACK TEMP
HIGH  146  142  145  149  151  130  130  128  144  131  134  136  169  170  171  171  170  170  167  165  165  165  164  164
 AVG  143  139  143  145  146  125  127  125  129  128  132  133  167  168  170  170  170  169  166  165  164  164  163  163  151
 LOW       137  142  144  127  123  124  123  123  126  128  130  166  165  168  170  169  166  165  164  163  163  163  163

450 FT STACK TEMP
HIGH                                                       136  134  139  139  140  160  162  157  148  141  146  149
 AVG                                                       133  132  138  137  138  146  160  153  143  139  141  148
 LOW                                                       126  128  136  135  136  140  158  148  137  138  137  147


STATION #10     ACID PLANT STACK

FLOW   70   68   70   71   72   73   72   73   71   54   64   73   72   65   73   74   73   73   73   75   74   77   77   75   71
ACFM ,523 ,905 ,253 ,405 ,483 ,916 ,175 ,888 ,841 ,546 ,543 ,843 ,507 ,560 ,843 ,933 ,120 ,083 ,537 ,166 ,651 ,420 ,175 ,595 ,815
TEMP  176  168  169  177  183  181  173  172  160  158  153  182  171  170  175  177  171  175  177  169  166  174  176  181  172
PRES-0.12-0.14-0.14-0.11-0.10-0.11-0.14 0.00 0.00-0.62-0.30-0.13-0.19-0.15-0.07-0.07-0.13-0.15-0.09-0.12-0.15-0.14-0.14-0.11-0.15
BARO 2448 2449 2449 2449 2449 2449 2450 2449 2450 2450 2449 2447 2446 2445 2444 2443 2443 2443 2444 2445 2445 2446 2446 2445 2447
FLOW   47   46   47   47   47   49   48   49   49   36   44   48   48   44   49   49   49   48   49   50   50   51   51   50   48
SCFM ,163 ,708 ,528 ,707 ,956 ,068 ,559 ,746 ,341 ,449 ,520 ,908 ,843 ,188 ,361 ,941 ,207 ,825 ,012 ,799 ,702 ,896 ,588 ,104 ,224

SO2 EMITTED
PPM   608  538  574  609  592  433  445  279  376  401  526  454  299  435  487  519  393  618  490  240  376  446  470  659  470
PNDS  297  261  284  302  295  221  225  143  193  203  269  230  152  205  249  271  201  313  248  126  199  240  252  344  239
```

```
ATE: 10/ 6/78                          DAILY REPORT                          JULIAN DAY: 279

                                      STACK MONITORS

     0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400  AVG

TATION #9    MAIN STACK

LOW   334  340  323  329  302  302  336  331  338  325  303  303  303  264  264  255  234  279  250  263  257  257  285  246  293
CFM  ,812 ,099 ,511 ,044 ,069 ,957 ,161 ,030 ,458 ,969 ,510 ,394 ,194 ,236 ,507 ,862 ,707 ,914 ,573 ,849 ,345 ,495 ,765 ,372 ,118
MP    205  207  204  205  203  202  204  196  196  193  195  195  197  199  204  203  202  204  203  201  201  201  202  200  201
RES-1.71-1.72-1.75-1.73-1.73-1.75-1.75-1.71-1.68-1.66-1.63-1.59-1.54-1.53-1.57-1.59-1.58-1.56-1.54-1.51-1.52-1.51-1.55-1.58-1.62
ARO  2423 2424 2423 2422 2422 2422 2422 2423 2424 2425 2424 2422 2421 2419 2418 2418 2418 2417 2417 2418 2418 2418 2417 2417 2420
LOW   210  213  203  207  190  191  211  211  216  209  194  194  193  167  166  161  148  176  158  167  162  163  180  156  185
CFM  ,978 ,740 ,966 ,190 ,707 ,697 ,905 ,403 ,151 ,177 ,274 ,124 ,122 ,824 ,683 ,459 ,372 ,353 ,136 ,044 ,887 ,043 ,570 ,033 ,702

02 EMITTED
 %   3.16 3.21 2.93 2.43 2.57 2.63 2.49 2.20 2.85 2.79 2.76 3.20 3.50 4.08 3.07 3.25 2.99 3.68 3.32 3.42 3.52 4.37 4.73 3.75 3.21
NDS    69   71   62   53   51   52   53   48   64   60   55   64   70   71   53   54   46   67   52   59   60   74   88   60   74
     ,568 ,789 ,114 ,594 ,121 ,924 ,803 ,682 ,010 ,664 ,855 ,830 ,279 ,192 ,599 ,874 ,189 ,516 ,652 ,958 ,716 ,022 ,832 ,798 ,550

ARTICULATE EMITTED
G/M
NDS

50 FT STACK TEMP
IGH   164  164  165  165  164  163  163  165            164  166  169  170  171  170  170  170  167  167  167  167  167  166
AVG   163  164  164  165  162  162  162  162            163  165  168  169  169  169  168  169  167  167  167  166  166  165  166
LOW        163  163  165  161  160  161  160            163  164  167  168  165  169  168  167  166  166  166  166  166  164

50 FT STACK TEMP
IGH   155  156  158  160  146  143  145  142            143  144  146  142  141  159  151  152  151  149  146  147  152  153
AVG   151  154  155  153  144  140  143  138            140  140  142  139  139  142  142  143  149  147  143  143  146  152  145
LOW        153  153  146  134  135  142  134            137  138  136  137  136  138  138  139  148  145  138  139  142  151


TATION #10     ACID PLANT STACK

LOW    74   75   75        72        78  125       126  124  121  123  122  123  121  120  121  121  119  121  121  123  123  112
CFM  ,039 ,022 ,538      ,556      ,143 ,232      ,809 ,750 ,785 ,415 ,900 ,721 ,246 ,842 ,246 ,516 ,801 ,528 ,258 ,170 ,611 ,985
MP    184. 187  183       172       173  189       186  181  175  179  186  185  178  181  181  183  176  176  181  187  186  182
RES-0.12-0.11-0.11     -0.14     -0.08-0.03     -0.01-0.00-0.19-0.23-0.15-0.06-0.12-0.14-0.09-0.12-0.15-0.16-0.14-0 11-0.13-0.12
ARO  2445 2445 2444 2444 2444 2444 2444 2444 2446 2446 2446 2444 2442 2441 2440 2439 2439 2439 2439 2440 2440 2440 2439 2438 2442
LOW    48   49   49    0   48    0   52   81    0   83   82   81   81   80   81   80   79   80   80   79   80   80   80   81   74
CFM  ,818 ,264 ,917 ,000 ,715 ,000 ,407 ,957 ,000 ,512 ,674 ,454 ,927 ,712 ,342 ,554 ,916 ,186 ,084 ,855 ,994 ,244 ,677 ,041 ,707

U2 EMITTED
PM    682  769  669  539  526  540  501  528  593  638  442  584  686  885  575  533  476  686  588  521  663  875 1078  685  646
NDS   346  394            266       277  450       555  381  495  584  742  485  446  396  571  489  433  558  730  903  578  515
```

SITE: Highway Junction
DATE: 2-9-79
TIME 0815 MST

| LEVEL(AGL) (meters) | WIND SPEED (m/sec) | WIND DIRECTION (degrees) |
|---|---|---|
| SFC | 6.7 | 210 |
| 100 | 13.2 | 212 |
| 200 | 5.7 | 233 |
| 300 | 4.4 | 262 |
| 500 | 8.2 | 266 |
| 750 | 13.4 | 276 |
| 1000 | 10.7 | 271 |
| 1500 | 19.7 | 273 |

| LEVEL(AGL) (meters) | Temperature - °C |
|---|---|
| 2140 | |
| 2033 | -10.0 |
| 1926 | -9.0 |
| 1819 | -8.3 |
| 1712 | -7.8 |
| 1605 | -7.2 |
| 1498 | -6.9 |
| 1391 | -6.3 |
| 1284 | -5.9 |
| 1177 | -5.3 |
| 1070 | -3.5 |
| 963 | -2.5 |
| 856 | -1.6 |
| 749 | -0.3 |
| 642 | 0.7 |
| 535 | 1.2 |
| 428 | 1.8 |
| 321 | 2.7 |
| 214 | 2.3 |
| 107 | 2.3 |
| SFC | 1.5 |



SITE: Highway Junction
DATE: 2-9-79
TIME: 0815 MST

HOLZWORTH CLASSIFICATION SCHEME FOR INVERSIONS

| INV. BASE (M AGL) | THICKNESS (M) | TYPE | DT/DZ (C/100M) |
|---|---|---|---|
| 0.0 | 107.0 | 2 | 0.748 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

| MIXING HEIGHT (M) | AVERAGE WIND SPEED THRU MIXED LAYER (m/sec) |
|---|---|
| 217.9 | 9.0 |

| FIRST INVERSION LAPSE RATE (C/100M) | LAPSE RATE BELOW FIRST INVERSION (C/100M) |
|---|---|
| 0.748 | ----- |

# SMELTER EMISSIONS DATA

Date: February 9, 1979

|  | NEW FLUE |  |  | ACID PLANT |  |  | MAIN STACK |  |  |
|---|---|---|---|---|---|---|---|---|---|
| Hour | Temp. degree F | $SO_2$ Conc. % | Flow Rate scfm x$10^4$ | Temp. degree F | $SO_2$ Conc. ppm | Flow Rate scfm x$10^4$ | Temp. degree F. 450 ft. | Flow Rate scfm x$10^4$ | Flow Rate scfm x$10^4$ |
| 01 | 193 | 4.56 | 20.22 | 191 | 1315 | 6.19 | 152 | 30.48 | 51.56 |
| 02 | 194 | 3.23 | 20.16 | 166 | 812 | 6.52 | 153 | West Treater Inlet Values Recorded 1/24 hours | East Treater Inlet Values recorded 1/24 hours |
| 03 | 193 | 2.96 | 20.02 | 160 | 619 | 6.49 | 152 |  |  |
| 04 | 193 | 3.82 | 20.35 | 174 | 848 | 6.16 | 154 |  |  |
| 05 | 193 | 4.20 | 20.54 | 180 | 1112 | 6.29 | 155 |  |  |
| 06 | 193 | 4.64 | 20.50 | 182 | 1109 | 6.38 | 154 |  |  |
| 07 | 195 | 3.24 | 20.41 | 180 | 603 | 6.42 | 144 |  |  |
| 08 | 194 | 3.33 | 20.38 | 168 | 572 | 6.72 | 144 |  |  |
| 09 | 192 | 4.37 | 20.69 | 175 | 1201 | 6.93 | 140 |  |  |
| 10 | 162 | 4.29 | 20.76 | 280 | 1150 | 7.95 | 136 |  |  |
| 11 | 159 | 3.05 | 18.87 | 174 | 744 | 8.00 | 136 |  |  |
| 12 | 160 | 3.51 | 18.54 | 176 | 1127 | 7.97 | 137 |  |  |
| 13 | 160 | 3.66 | 18.68 | 177 | 1036 | 7.99 | 136 |  |  |
| 14 | 160 | 4.53 | 18.96 | 200 | 1400 | 7.91 | 137 |  |  |
| 15 | 160 | 4.23 | 19.14 | 187 | 1396 | 7.89 | 137 |  |  |
| 16 | 179 | 4.14 | 18.23 | 167 | 971 | 7.96 | 137 |  |  |
| 17 | 191 | 2.12 | 19.72 | 168 | 357 | 8.23 | 140 |  |  |
| 18 | 193 | 1.29 | 20.58 | 164 | 213 | 8.63 | 139 |  |  |
| 19 | 193 | 1.04 | 20.92 | 189 | 198 | 8.43 | 155 |  |  |
| 20 | 195 | 0.29 | 20.61 | 169 | 24 | 7.31 | 154 |  |  |
| 21 | 192 | 0.28 | 19.48 | 187 | 23 | 8.59 | 152 |  |  |
| 22 | 191 | 0.77 | 19.69 | 195 | 109 | 8.50 | 152 |  |  |
| 23 | 190 | 1.26 | 20.00 | 190 | 219 | 8.43 | 152 |  |  |
| 24 | 190 | 1.44 | 20.19 | 187 | 231 | 8.32 | 151 |  |  |

Pounds of Copper Produced - 776,680

## SMELTER EMISSIONS DATA

Date: February 10, 1979

|  | NEW FLUE |  |  | ACID PLANT |  |  | MAIN STACK |  |  |
|---|---|---|---|---|---|---|---|---|---|
| Hour | Temp. degree F | $SO_2$ Conc. % | Flow Rate scfm x$10^4$ | Temp. degree F | $SO_2$ Conc. ppm | Flow Rate scfm x$10^4$ | Temp. degree F. 450 ft. | Flow Rate scfm x$10^4$ | Flow Rate scfm x$10^4$ |
| 01 | 196 | .07 | 24.00 | 177 | 31 | 4.02 | 152 | 29.41 | 37.62 |
| 02 | 199 | .00 | 26.51 | 105 | 19 | .05 | 153 | West Treater Inlet<br>Values Recorded 1/24 hours | East Treater Inlet<br>Values recorded 1/24 hours |
| 03 | 161 | .00 | 3.46 | 100 | 18 | .04 | 153 |  |  |
| 04 | 104 | .02 | .00 | 100 | 21 | .03 | 155 |  |  |
| 05 | 100 | .02 | .00 | 100 | 23 | .04 | 156 |  |  |
| 06 | 100 | .02 | .00 | 100 | 37 | .04 | 156 |  |  |
| 07 |  | .02 | .39 | 100 | 43 | .03 | 144 |  |  |
| 08 |  | .02 | 1.87 | 100 | 42 | .03 | 144 |  |  |
| 09 |  | .01 | 2.12 | 100 | 43 | .04 | 144 |  |  |
| 10 |  | .02 | 1.87 | 100 | 42 | .04 | 144 |  |  |
| 11 |  | .02 | .33 | 101 | 49 | .42 | 144 |  |  |
| 12 | 117 | 1.31 | 10.81 | 103 | 400 | 2.93 | 142 |  |  |
| 13 | 180 | 2.26 | 16.62 | 156 | 1373 | 8.17 | 140 |  |  |
| 14 | 188 | 2.16 | 15.18 | 193 | 1042 | 8.21 | 141 |  |  |
| 15 | 190 | 2.85 | 17.20 | 196 | 1074 | 8.17 | 141 |  |  |
| 16 | 191 | 2.49 | 18.47 | 182 | 695 | 8.21 | 142 |  |  |
| 17 | 191 | 3.55 | 18.57 | 182 | 1010 | 8.07 | 143 |  |  |
| 18 | 191 | 4.76 | 18.59 | 186 | 1325 | 7.98 | 144 |  |  |
| 19 | 191 | 2.77 | 18.54 | 172 | 675 | 8.00 | 158 |  |  |
| 20 | 191 | 2.04 | 19.52 | 167 | 486 | 7.61 | 153 |  |  |
| 21 | 196 | 0.76 | 20.76 | 162 | 99 | 6.85 | 151 |  |  |
| 22 | 190 | 2.74 | 19.08 | 185 | 565 | 8.18 | 151 |  |  |
| 23 | 190 | 2.70 | 18.60 | 181 | 556 | 8.17 | 153 |  |  |
| 24 | 190 | 2.34 | 18.58 | 171 | 524 | 8.15 | 152 |  |  |

Pounds of Copper Produced - 202,360

Date 02/09/79

| HOUR | Wind Direction (Degrees) SITE: H.J. | L.S. | C-H | W-H | Wind Speed (m/sec) H.J. | L.S. | C-H | W-H | SO$_2$ Concentration (ppm) H.J. | L.S. | C-H | M.C. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | 225 | 255 | 197 | 247 | 8.0 | 0.7 | 8.5 | 18.7 | 1.23 | 0.00 | 0.0 | 0.0 |
| 02 | 225 | 250 | 198 | 246 | 9.1 | 0.5 | 7.2 | 18.3 | .87 | 0.01 | | 0.0 |
| 03 | 225 | 320 | 203 | 249 | 9.1 | 0.2 | 8.5 | 17.4 | 1.16 | 0.00 | | 0.0 |
| 04 | 220 | 235 | 223 | 250 | 6.8 | 0.5 | 9.4 | 16.5 | .18 | 0.00 | | 0.0 |
| 05 | 220 | 30 | 202 | 251 | 4.3 | 0.5 | 6.3 | 14.8 | .90 | 0.01 | | 0.0 |
| 06 | 225 | 315 | 197 | 251 | 5.5 | 0.2 | 5.4 | 13.9 | .45 | 0.00 | | 0.01 |
| 07 | 220 | 90 | 204 | 251 | 5.2 | 0.2 | 4.5 | 13.0 | .31 | | | 0.0 |
| 08 | 225 | 195 | 200 | 247 | 5.5 | 1.1 | 7.6 | 16.1 | .26 | | | |
| 09 | 225 | 190 | 195 | 247 | 7.7 | 2.3 | 8.9 | 17.0 | 1.03 | | | |
| 10 | 220 | 185 | 189 | 248 | 8.9 | 2.7 | 9.4 | 16.7 | 1.60 | | | |
| 11 | 225 | 200 | 193 | 246 | 8.0 | 2.5 | 9.4 | 15.6 | 1.23 | | | |
| 12 | 225 | 200 | 185 | 247 | 7.5 | 2.3 | 8.9 | 16.1 | .90 | | | |
| 13 | 220 | 210 | 171 | 247 | 9.1 | 2.3 | 11.2 | 18.3 | | | | |
| 14 | 225 | 210 | 181 | 247 | 9.5 | 2.3 | 12.5 | 18.7 | 1.98 | | | |
| 15 | 220 | 220 | 179 | 246 | 9.1 | 2.0 | 10.7 | 17.0 | 2.30 | | | |
| 16 | 225 | 220 | 178 | 247 | 8.4 | 2.3 | 9.8 | 17.9 | 1.55 | | | |
| 17 | 225 | 210 | 180 | 249 | 8.2 | 2.0 | 9.4 | 15.6 | .64 | | | |
| 18 | 225 | 200 | 183 | 249 | 8.0 | 2.0 | 8.5 | 15.6 | .45 | | | |
| 19 | 225 | 200 | 179 | 249 | 8.0 | 2.5 | 8.9 | 14.8 | .51 | | | |
| 20 | 225 | 200 | 178 | 248 | 8.2 | 2.6 | 7.6 | 15.2 | .10 | | | |
| 21 | 230 | 205 | 185 | 246 | 7.0 | 2.3 | 8.0 | 15.2 | .10 | | | |
| 22 | 230 | 205 | 194 | 247 | 6.6 | 2.3 | 9.8 | 15.2 | .16 | | | |
| 23 | 225 | 210 | 193 | 246 | 6.1 | 2.5 | 13.0 | 16.1 | .14 | | | |
| 24 | 230 | 215 | 197 | 247 | 7.3 | 2.0 | 12.5 | 16.1 | .16 | | | |

DATE 02/10/79

| HOUR | Wind Direction H.J. | L.S. | C-H | W-H | Wind Speed H.J. | L.S. | C-H | W-H | SO$_2$ H.J. | L.S. | C-H | M.C. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | 225 | 200 | 192 | 246 | 8.2 | 1.6 | 10.3 | 16.5 | .09 | 0.00 | 0.0 | 0.0 |
| 02 | 220 | 150 | 192 | 244 | 7.0 | 1.1 | 9.4 | 16.1 | .00 | | | |
| 03 | 220 | 220 | 185 | 244 | 6.4 | 1.1 | 7.2 | 15.2 | .00 | | | |
| 04 | 225 | 270 | 203 | 246 | 5.2 | 0.2 | 6.7 | 17.0 | .00 | | | |
| 05 | 210 | 235 | 218 | 246 | 3.9 | 0.5 | 7.6 | 16.1 | .00 | | | |
| 06 | 210 | 235 | 191 | 245 | 6.4 | 0.5 | 6.7 | 15.6 | .00 | | | |
| 07 | 215 | 280 | 189 | 247 | 5.0 | 0.2 | 6.7 | 13.9 | .00 | | | |
| 08 | 215 | 215 | 185 | 250 | 6.1 | 0.9 | 7.6 | 13.4 | .00 | | | |
| 09 | 220 | 225 | 197 | 249 | 5.5 | 0.9 | 7.2 | 11.2 | .00 | | | |
| 10 | 210 | 195 | 189 | 247 | 5.9 | 1.6 | 8.9 | 12.1 | .00 | | | |
| 11 | 210 | 200 | 191 | 246 | 7.0 | 2.0 | 10.3 | 13.9 | .02 | | | |
| 12 | 210 | 210 | 185 | 245 | 7.3 | 1.8 | 12.1 | 17.0 | .03 | | | |
| 13 | 210 | 205 | 185 | 243 | 7.5 | 1.8 | 11.6 | 15.6 | | | | |
| 14 | 210 | 195 | 177 | 242 | 8.0 | 2.7 | 10.7 | 15.6 | .05 | | | |
| 15 | 215 | 205 | 182 | 247 | 7.3 | 2.0 | 9.4 | 13.9 | .16 | | | |
| 16 | 210 | 205 | 201 | 247 | 7.5 | 2.3 | 8.9 | 11.2 | .23 | | | |
| 17 | 210 | 195 | 195 | 246 | 7.5 | 2.3 | 9.8 | 12.1 | .29 | | | |
| 18 | 210 | 205 | 195 | 244 | 7.3 | 1.6 | 10.7 | 13.9 | .26 | | | |
| 19 | 200 | 210 | 192 | 244 | 8.2 | 2.5 | 15.2 | 17.0 | .17 | | | |
| 20 | 215 | 215 | 193 | 245 | 10.0 | 2.7 | 16.1 | 18.8 | .47 | | | |
| 21 | 210 | 215 | 192 | 245 | 10.2 | 4.3 | 15.6 | 19.2 | .06 | | | |
| 22 | 215 | 215 | 192 | 245 | 11.4 | 4.1 | 15.6 | 17.9 | .97 | | | |
| 23 | 210 | 205 | 195 | 245 | 10.0 | 3.4 | 14.8 | 15.2 | .43 | | | |
| 24 | 210 | 215 | 191 | 244 | 9.1 | 2.5 | 15.6 | 16.5 | .35 | | | |

MC - Mill Creek Site
HJ - Highway Junction Site
LS - Lincoln School Site

C-H - C-Hill Site
W-H - Weather Hill Site
WO - Water Office

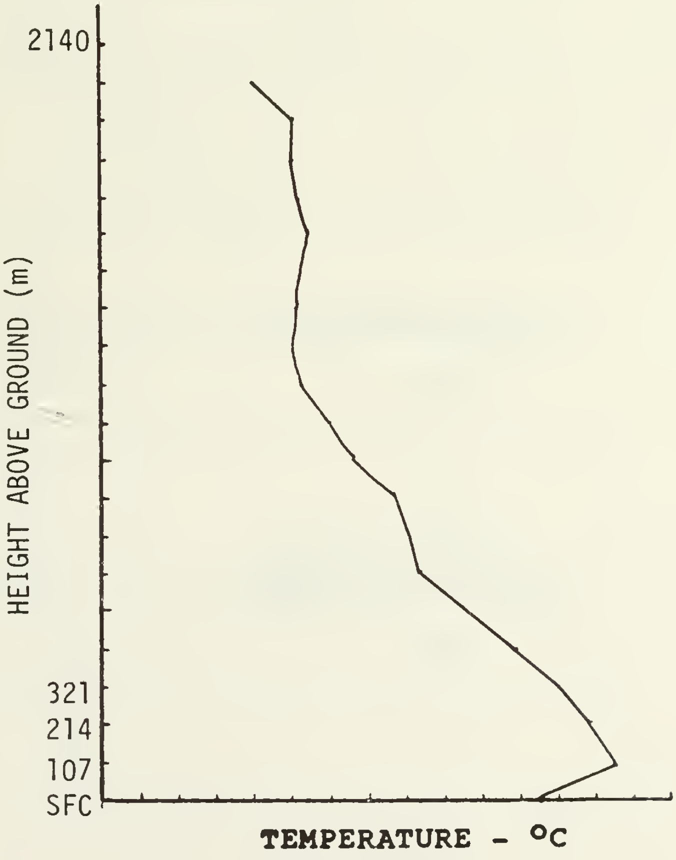
```
DATE:  2/ 9/79                                   DAILY REPORT                                  JULIAN DAY:  40

                                               STACK MONITORS

      0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400  AVG

STATION #9    MAIN STACK

FLOW  218  217  215  220  223  222  222  221  225  211  281  277  279  283  286  281  302  323  329  325  306  308  314  316  309
ACFM ,406 ,887 ,707 ,569 ,639 ,810 ,283 ,907 ,625 ,249 ,521 ,135 ,329 ,898 ,519 ,059 ,495 ,975 ,545 ,264 ,060 ,965 ,040 ,877 ,334
TEMP  193  194  193  193  193  193  195  194  192  162  159  160  160  160  160  179  191  193  193  195  192  191  190  190  184
PRES-1.96-2.01-1.98-1.87-1.89-1.83-1.92-1.88-1.97-1.90-1.89-1.89-1.90-1.93-1.92-1.89-1.93-1.91-1.93-1.89-1.90-1.90-2.00-2.00-1.92
BARO 2399 2399 2399 2397 2397 2398 2398 2398 2398 2399 2400 2400 2399 2397 2397 2397 2399 2400 2401 2400 2400 2399 2397 2397 2399
FLOW  202  201  200  203  205  204  204  203  206  207  198  195  186  199  191  182  197  205  209  206  194  196  200  201  199
SCFM ,201 ,611 ,207 ,469 ,406 ,974 ,121 ,862 ,914 ,609 ,679 ,389 ,827 ,634 ,395 ,276 ,173 ,784 ,217 ,086 ,760 ,919 ,064 ,926 ,021

SO2 EMITTED
  %  4.56 3.23 2.96 3.82 4.20 4.64 3.24 3.23 4.37 4.29 3.05 3.51 3.66 4.53 4.23 4.14 2.12 1.29 1.04 0.29 0.28 0.77 1.26 1.44 2.89
PNUS   95   67   61   80   89   98   68   70   93   92   59   67   71   89   84   79   42   27   23    6    5   15   26   30   24
     ,785 ,764 ,600 ,850 ,453 ,931 ,993 ,666 ,831 ,195 ,858 ,681 ,365 ,431 ,196 ,422 ,754 ,557 ,051 ,022 ,728 ,713 ,215 ,207 ,045

PARTICULATE EMITTED
UG/M      13.5  8.2  9.7  5.7  8.7  5.7  2.5  3.8  7.1  2.6  3.3  1.3  4.5  3.8 10.4  9.6  8.1 13.4  8.3  7.3 10.2  7.4  6.4  6.9
PNUS      10.2  6.2  7.4  4.4  6.7  4.3  1.9  3.0  5.7  1.9  2.3  0.9  3.2  2.7  7.0  7.2  6.2 10.4  6.4  5.3  7.5  5.6  4.8  5.2

150 FT STACK TEMP
HIGH  160  161  160  163  163  165  166  167  167  161  159  161  160  161  161  167  168  168  163  162  161  161  160  159
 AVG  159  160  159  161  162  162  165  165  165  158  157  160  159  160  160  163  167  167  162  161  160  160  159  159  161
 LOW       159  158  160  161  162  165  164  164  158  156  159  158  159  159  159  167  166  162  160  159  160  158  158

450 FT STACK TEMP
HIGH  153  153  152  155  156  156  145  159  142  139  137  138  137  138  155  140  141  141  156  155  153  153  153  152
 AVG  152  153  152  154  155  154  144  144  140  136  136  137  136  137  137  137  140  139  155  154  152  152  152  151  146
 LOW       152  152  152  155  144  143  140  139  135  125  135  125  136  133  125  139  139  155  153  152  152  152  151


STATION #10     ACID PLANT STACK

FLOW   95   97   95   92   95   97   97  100  104  121  120  120  121  124  121  119  122  127  129  109  132  132  130  128  114
ACFM ,725 ,072 ,664 ,970 ,762 ,453 ,747 ,291 ,669 ,026 ,474 ,107 ,001 ,272 ,331 ,139 ,851 ,924 ,970 ,282 ,016 ,310 ,227 ,193 ,063
TEMP  191  166  160  174  190  192  190  168  175  190  174  175  177  200  187  167  169  164  199  169  187  195  190  187  179
PRES-0.06-0.05-0.06-0.06-0.06-0.06-0.06-0.06-0.06-0.06-0.05-0.06-0.06-0.06-0.06-0.06-0.06-0.06-0.06-0.06-0.05-0.06-0.06-0.06-0.06
BARO 2421 2421 2420 2419 2419 2420 2420 2420 2420 2421 2422 2422 2420 2419 2419 2419 2421 2421 2422 2422 2422 2421 2419 2418 2420
FLOW   61   65   64   61   62   63   64   67   69   79   80   79   79   79   78   79   82   86   84   73   85   84   84   83   75
SCFM ,852 ,238 ,924 ,563 ,912 ,848 ,239 ,275 ,270 ,499 ,047 ,664 ,929 ,112 ,936 ,859 ,317 ,307 ,337 ,077 ,914 ,971 ,262 ,238 ,108

SO2 EMITTED
PPM  1315  812  619  849 1112 1109  603  572 1201 1150  744 1127 1036 1400 1396  971  357  213  198   24   23  109  219  231  727
PNUS  846  547  418  543  727  736  399  400  865  950  619  932  961            804  302  191  173   20   20   96  191  199  549
```

```
                                      THE ANACONDA COMPANY
                                    MONTANA MINING DIVISION
                                      ANACONDA OPERATIONS

DATE: 2/10/79                            DAILY REPORT                              JULIAN DAY: 41

                                         STACK MONITORS

     0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400  AVG

STATION #9    MAIN STACK

FLOW  380  421   54    0    0    0    6   29   33   29    5  154  256  237  270  291  292  293  292  308  330  300  293  293  190
ACFM ,455 ,841 ,284 ,000 ,000 ,000 ,070 ,415 ,350 ,360 ,144 ,523 ,515 ,799 ,606 ,046 ,767 ,297 ,680 ,428 ,512 ,895 ,496 ,110 ,896
TEMP  196  199  161  104  100  100                           117  180  188  190  191  191  191  191  191  196  190  190  190  172
PRES-1.90-1.86-1.90-1.84-1.79-1.80-1.79-1.80-1.77-1.82-1.83-1.90-1.90-1.90-1.88-1.91-1.95-1.97-2.08-2.12-2.05-2.06-2.05-2.07-1.91
BARO 2397 2398 2399 2397 2397 2396 2397 2397 2398 2397 2397 2395 2394 2393 2390 2390 2390 2389 2386 2384 2385 2386 2386 2385 2393
FLOW  240  265   34    0    0    0    3   18   21   18    3  108  166  151  171  184  185  185  185  195  207  190  185  185  121
SCFM ,024 ,135 ,609 ,000 ,000 ,000 ,858 ,694 ,202 ,659 ,268 ,133 ,172 ,781 ,967 ,717 ,669 ,859 ,382 ,170 ,629 ,765 ,978 ,815 ,416

SO2 EMITTED
  %  0.07 0.00 0.00 0.02 0.02 0.02 0.02 0.02 0.01 0.02 0.02 1.31 2.26 2.16 2.85 2.49 3.55 4.76 2.77 2.04 0.76 2.74 2.70 2.34 1.37
PNDS    1    0    0    0    0    0    0    0    0    0    0   29   40   34   49   48   68   92   53   40   15   54   52   45   50
     ,481 ,174 ,022 ,000 ,000 ,000 ,006 ,030 ,032 ,030 ,008 ,165 ,371 ,066 ,922 ,005 ,621 ,052 ,415 ,346 ,303 ,395 ,226 ,291 ,637

PARTICULATE EMITTED
UG/M 24.5 36.2                                                        32.5 31.4 23.0  7.2  2.1  7.1 14.1  8.1  3.2 44.2
PNDS 23.5 35.9                                                        18.4 19.9 15.9  5.0  1.5  5.0 10.3  6.4  2.2 30.8

150 FT STACK TEMP
HIGH  162  162  165  168  170  173  175  175  176  176  176  176  165  166  168  168  169  170  166  161  160  159  161  160
 AVG  160  161  162  166  169  169  174  174  175  175  175  170  164  165  167  167  168  169  164  160  159  158  160  158  166
 LOW       161  160  165  168  169  174  174  175  174  173  162  163  165  166  167  168  166  161  159  158  157  159  158

450 FT STACK TEMP
HIGH  153  154  155  156  158  158  145  144  147  146  145  145  141  141  142  143  144  160  160  155  152  152  154  153
 AVG  152  153  153  155  156  156  144  144  144  144  144  142  140  141  141  142  143  144  158  153  151  151  153  152  148
 LOW       153  152  155  155  143  143  143  140  143  143  139  139  140  141  141  142  142  155  152  151  151  152  152


STATION #10   ACID PLANT STACK

FLOW   61    0    0    0    0    0    0    0    0    0    5   39  119  127  127  125  123  123  120  114  102  126  125  122   65
ACFM ,762 ,637 ,521 ,453 ,465 ,490 ,453 ,453 ,539 ,588 ,697 ,243 ,892 ,826 ,936 ,706 ,464 ,023 ,830 ,128 ,133 ,159 ,130 ,986 ,474
TEMP  177  105  100  100  100  100  100  100  100  100  101  103  156  193  196  182  182  186  172  167  162  185  181  171  143
PRES-0.06-0.06-0.06-0.06-0.06-0.06-0.06-0.06-0.06-0.06-0.06-0.06-0.06-0.06-0.07-0.06-0.06-0.07-0.07-0.06-0.06-0.06-0.06-0.06-0.06
BARO 2419 2420 2420 2419 2419 2418 2418 2419 2419 2419 2418 2417 2416 2414 2412 2412 2412 2410 2409 2406 2406 2407 2407 2407 2414
FLOW   40    0    0    0    0    0    0    0    0    0    4   29   81   82   81   82   80   79   79   76   68   81   81   81   43
SCFM ,179 ,473 ,391 ,340 ,349 ,367 ,340 ,340 ,404 ,441 ,248 ,333 ,746 ,109 ,735 ,099 ,660 ,815 ,952 ,130 ,527 ,804 ,730 ,482 ,139

SO2 EMITTED
PPM    31   19   18   21   23   37   43   42   43   42   49   40 1373 1042 1074  695 1010 1325  675  486   99  565  556  524  424
PNDS   15    0    0    0    0    0    0    0    0    0    2                 889  911  593  845        563  400   81  481  473  444  345
```

SITE: Highway Junction
DATE: 3-6-79
TIME 0740 MST

| LEVEL(AGL) (meters) | WIND SPEED (m/sec) | WIND DIRECTION (degrees) |
|---|---|---|
| SFC | 4.5 | 280 |
| 100 | 12.3 | 276 |
| 200 | 10.3 | 274 |
| 300 | 10.0 | 274 |
| 500 | 8.2 | 281 |
| 750 | 13.2 | 289 |
| 1000 | 12.0 | 309 |
| 1500 | 34.3 | 307 |

| LEVEL(AGL) (meters) | Temperature - °C |
|---|---|
| 2140 | |
| 2033 | -1.0 |
| 1926 | 0.0 |
| 1819 | 0.3 |
| 1712 | 0.5 |
| 1605 | 0.7 |
| 1498 | 0.3 |
| 1391 | 0.0 |
| 1284 | -0.1 |
| 1177 | 0.2 |
| 1070 | 0.8 |
| 963 | 1.6 |
| 856 | 2.6 |
| 749 | 3.0 |
| 642 | 3.3 |
| 535 | 4.3 |
| 428 | 5.8 |
| 321 | 7.1 |
| 214 | 8.1 |
| 107 | 8.6 |
| SFC | 6.5 |



SITE: Highway Junction
DATE: 3-6-79
TIME: 0740 MST

## HOLZWORTH CLASSIFICATION SCHEME FOR INVERSIONS

| INV. BASE (M AGL) | THICKNESS (M) | TYPE | DT/DZ (C/100M) |
|---|---|---|---|
| 0.0 | 107.0 | 3 | 1.962 |
| 1337.7 | 267.5 | 1 | 0.299 |
| | | | |
| | | | |
| | | | |
| | | | |

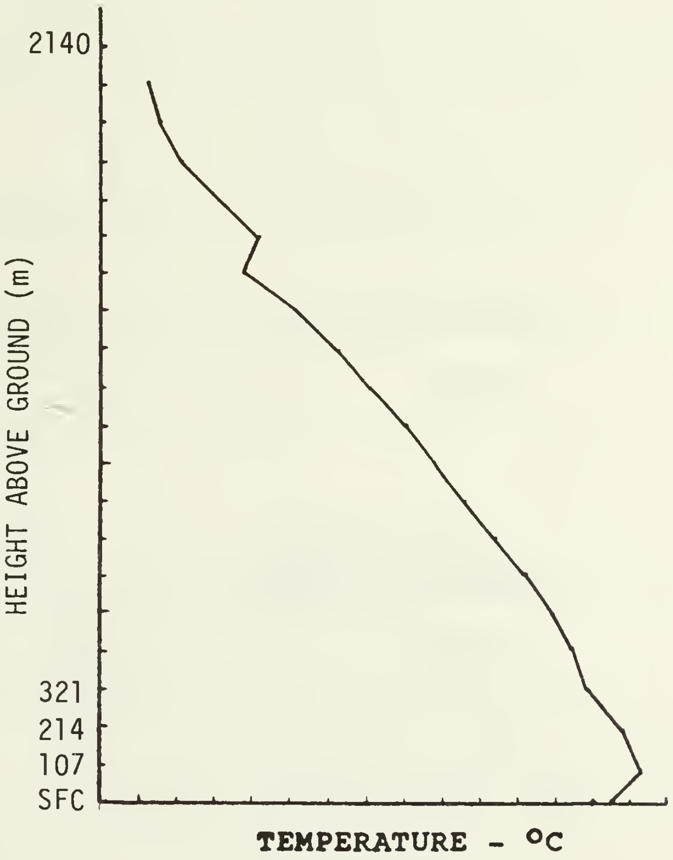
| MIXING HEIGHT (M) | AVERAGE WIND SPEED THRU MIXED LAYER (m/sec) |
|---|---|
| 94.6 | 9.6 |

| FIRST INVERSION LAPSE RATE (C/100M) | LAPSE RATE BELOW FIRST INVERSION (C/100M) |
|---|---|
| 1.962 | ------ |

SITE: Highway Junction
DATE: 3-6-79
TIME 1350 MST

| LEVEL(AGL) (meters) | WIND SPEED (m/sec) | WIND DIRECTION (degrees) |
|---|---|---|
| SFC | 3.6 | 280 |
| 100 | 11.3 | 277 |
| 200 | 9.6 | 272 |
| 300 | 11.5 | 267 |
| 500 | 13.6 | 272 |
| 750 | 10.9 | 274 |
| 1000 | 12.0 | 317 |
| 1500 | 13.3 | 321 |

| LEVEL(AGL) (meters) | Temperature - $^{o}C$ |
|---|---|
| 2140 | |
| 2033 | -3.8 |
| 1926 | -3.5 |
| 1819 | -2.8 |
| 1712 | -2.1 |
| 1605 | -0.9 |
| 1498 | -1.3 |
| 1391 | 0.1 |
| 1284 | 1.2 |
| 1177 | 2.0 |
| 1070 | 3.0 |
| 963 | 3.7 |
| 856 | 4.6 |
| 749 | 5.4 |
| 642 | 6.2 |
| 535 | 6.8 |
| 428 | 7.4 |
| 321 | 7.8 |
| 214 | 8.7 |
| 107 | 9.3 |
| SFC | 8.5 |



SITE: Highway Junction
DATE: 3-6-79
TIME: 1350 MST

HOLZWORTH CLASSIFICATION SCHEME FOR INVERSIONS

| INV. BASE (M AGL) | THICKNESS (M) | TYPE | DT/DZ (C/100M) |
|---|---|---|---|
| 0.0 | 107.0 | 2 | 0.748 |
| 1498.2 | 107.0 | 1 | 0.374 |
| | | | |
| | | | |
| | | | |
| | | | |

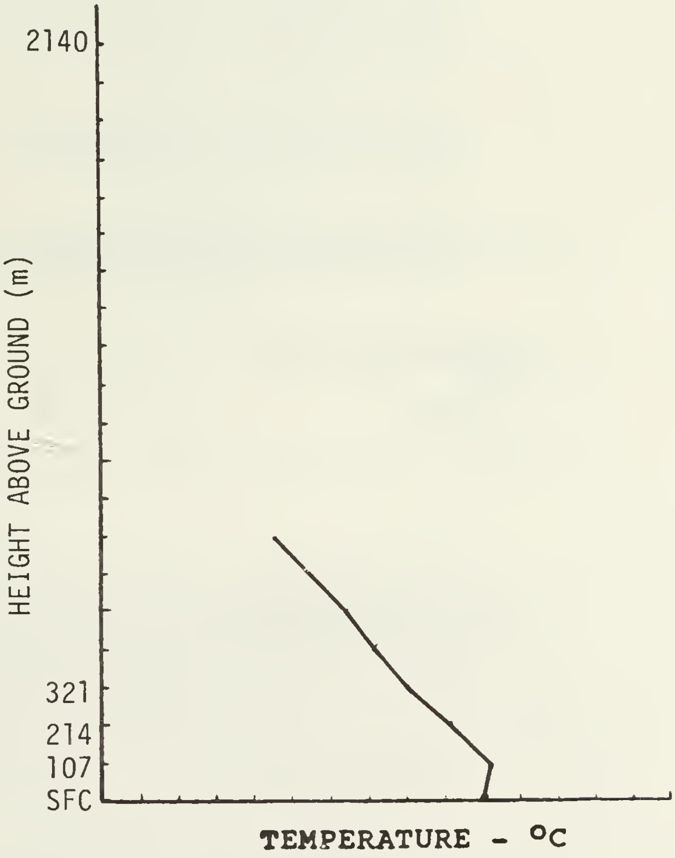
| MIXING HEIGHT (M) | AVERAGE WIND SPEED THRU MIXED LAYER (m/sec) |
|---|---|
| 387.0 | 11.6 |

| FIRST INVERSION LAPSE RATE (C/100M) | LAPSE RATE BELOW FIRST INVERSION (C/100M) |
|---|---|
| 0.748 | ------ |

SITE: Highway Junction
DATE: 03-7-79
TIME 1350 MST

| LEVEL(AGL) (meters) | WIND SPEED (m/sec) | WIND DIRECTION (degrees) |
|---|---|---|
| SFC | 6.7 | 270 |
| 100 | 12.5 | 272 |
| 200 | 13.0 | 273 |
| 300 | 7.3 | 274 |
| 500 | 20.4 | 274 |
| 750 | 22.2 | 271 |
| 1000 | 24.9 | 272 |

| LEVEL(AGL) (meters) | Temperature - °C |
|---|---|
| 2140 | |
| 2033 | |
| 1926 | |
| 1819 | |
| 1712 | |
| 1605 | |
| 1498 | |
| 1391 | |
| 1284 | |
| 1177 | |
| 1070 | |
| 963 | |
| 856 | |
| 749 | 0.5 |
| 642 | 1.5 |
| 535 | 2.4 |
| 428 | 3.2 |
| 321 | 4.0 |
| 214 | 5.2 |
| 107 | 6.2 |
| SFC | 6.0 |



SITE: Highway Junction
DATE: 3-7-79
TIME: 1350 MST

## HOLZWORTH CLASSIFICATION SCHEME FOR INVERSIONS

| INV. BASE (M AGL) | THICKNESS (M) | TYPE | DT/DZ (C/100M) |
|---|---|---|---|
| 0.0 | 82.6 | 1 | 0.363 |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

| MIXING HEIGHT (M) | AVERAGE WIND SPEED THRU MIXED LAYER (m/sec) |
|---|---|
| 531.9 | 16.8 |

| FIRST INVERSION LAPSE RATE (C/100M) | LAPSE RATE BELOW FIRST INVERSION (C/100M) |
|---|---|
| 0.363 | ------- |

# SMELTER EMISSIONS DATA

Date: March 6, 1979

| | NEW FLUE | | | ACID PLANT | | | MAIN STACK | | |
|---|---|---|---|---|---|---|---|---|---|
| Hour | Temp. degree F | $SO_2$ Conc. % | Flow Rate scfm x$10^4$ | Temp. degree F | $SO_2$ Conc. ppm | Flow Rate scfm x$10^4$ | Temp. degree F 450 ft. | Flow Rate scfm x$10^4$ | Flow Rate scfm x$10^4$ |
| 01 | 159 | 3.83 | 24.47 | 188 | 827 | 7.88 | 150 | N/A* | 48.17 |
| 02 | 156 | 3.83 | 22.97 | 1.89 | 770 | 7.86 | 151 | West Treater Inlet Values Recorded 1/24 hours | East Treater Inlet Values recorded 1/24 hours |
| 03 | 154 | 3.33 | 22.85 | 183 | 625 | 7.92 | 151 | | |
| 04 | 154 | 2.95 | 22.60 | 176 | 526 | 7.93 | 151 | | |
| 05 | 154 | 2.90 | 22.88 | 181 | 498 | 7.99 | 152 | | |
| 06 | 154 | 3.31 | 22.76 | 187 | 656 | 7.99 | 151 | | |
| 07 | 153 | 3.75 | 22.97 | 187 | 745 | 7.92 | 136 | | |
| 08 | 153 | 2.96 | 22.72 | 180 | 546 | 8.01 | 135 | | |
| 09 | 146 | 2.83 | 21.53 | 174 | 95 | 8.01 | 133 | | |
| 10 | 147 | 3.41 | 21.31 | 182 | 97 | 7.98 | 137 | | |
| 11 | 156 | 3.67 | 23.46 | 192 | 337 | 7.83 | 134 | | |
| 12 | 159 | 3.71 | 23.47 | 187 | 159 | 7.93 | 135 | | |
| 13 | 158 | | 23.27 | 185 | 242 | 7.91 | 134 | | |
| 14 | 159 | | 23.36 | 178 | 335 | 7.94 | 135 | | |
| 15 | 157 | | 23.39 | 185 | 779 | 7.90 | 135 | | |
| 16 | 164 | 2.84 | 25.97 | 188 | 643 | 7.91 | 135 | | |
| 17 | 165 | | 26.61 | 183 | 572 | 7.99 | 134 | | |
| 18 | 167 | 2.10 | 27.01 | 183 | 471 | 8.03 | 133 | | |
| 19 | 165 | 2.29 | 26.64 | 187 | 509 | 8.02 | 143 | | |
| 20 | 166 | 2.58 | 26.93 | 198 | 557 | 7.85 | 150 | | |
| 21 | 167 | 2.35 | 27.20 | 193 | 506 | 7.91 | 149 | | |
| 22 | 166 | 2.73 | 26.99 | 199 | 616 | 7.77 | 149 | | |
| 23 | 165 | 2.74 | 26.90 | 193 | 533 | 7.81 | 149 | | |
| 24 | 160 | 3.34 | 24.48 | 190 | 797 | 7.79 | 1.49 | | |

Pounds of Copper Produced - 919,200

* Data not available.

## SMELTER EMISSIONS DATA

Date: March 7, 1979

| | NEW FLUE | | | ACID PLANT | | | MAIN STACK | | |
|---|---|---|---|---|---|---|---|---|---|
| Hour | Temp. degree F | $SO_2$ Conc. % | Flow Rate scfm x$10^4$ | Temp. degree F | $SO_2$ Conc. ppm | Flow Rate scfm x$10^4$ | Temp. degree F. 450 ft. | Flow Rate scfm x$10^4$ | Flow Rate scfm x$10^4$ |
| 01 | 161 | 4.07 | 24.99 | 190 | 1066 | 7.86 | 149 | N/A* | 43.66 |
| 02 | 164 | 3.49 | 25.78 | 190 | 798 | 7.95 | 150 | West Treater Inlet<br>Values Recorded 1/24 hours | East Treater Inlet<br>Values recorded 1/24 hours |
| 03 | 163 | 2.26 | 25.68 | 180 | 438 | 8.01 | 150 | | |
| 04 | 163 | 2.25 | 25.87 | 175 | 475 | 8.05 | 149 | | |
| 05 | 163 | 3.15 | 25.82 | 178 | 725 | 7.97 | 149 | | |
| 06 | 164 | 3.28 | 25.88 | 180 | 8.5 | 7.90 | 147 | | |
| 07 | 163 | 3.05 | 26.03 | 180 | 636 | 7.92 | 132 | | |
| 08 | 162 | 2.58 | 25.81 | 175 | 525 | 7.96 | 129 | | |
| 09 | 165 | 1.53 | 23.76 | 169 | 294 | 8.18 | 130 | | |
| 10 | 183 | 4.14 | 15.45 | 172 | 1180 | 7.77 | 132 | | |
| 11 | 191 | 1.38 | 16.96 | 180 | 245 | 4.98 | 137 | | |
| 12 | 192 | 0.74 | 18.34 | 177 | 114 | 8.01 | 136 | | |
| 13 | 191 | 2.35 | 18.31 | 181 | 340 | 7.88 | 137 | | |
| 14 | 188 | 4.64 | 18.47 | 190 | 1336 | 7.62 | 135 | | |
| 15 | 186 | 4.05 | 18.29 | 183 | 1040 | 7.56 | 134 | | |
| 16 | 189 | 3.10 | 19.99 | 177 | 640 | 7.63 | 135 | | |
| 17 | 193 | 3.18 | 19.95 | 186 | 569 | 7.61 | 135 | | |
| 18 | 195 | 3.38 | 20.07 | 197 | 608 | 7.21 | 136 | | |
| 19 | 195 | 4.12 | 20.24 | 193 | 750 | 7.26 | 144 | | |
| 20 | 193 | 4.08 | 20.75 | 196 | 710 | 7.33 | 153 | | |
| 21 | 176 | 3.70 | 29.11 | 188 | 498 | 4.43 | 151 | | |
| 22 | 176 | 3.01 | 32.96 | 111 | 120 | 0.02 | 155 | | |
| 23 | 177 | 2.82 | 32.92 | 100 | 174 | 0.03 | 150 | | |
| 24 | 173 | 3.49 | 33.00 | 100 | 255 | 0.02 | 149 | | |

Pounds of Copper Produced - 920,500

* Data not available.

Wind Direction (Degrees)

SITE:

| H.J. | L.S. | C-H | W-H |
|---|---|---|---|
| 240 | 190 | 205 | 249 |
| 240 | 185 | 209 | 249 |
| 240 | 225 | 215 | 248 |
| 270 | 250 | 233 | 249 |
| 280 | 170 | 240 | 250 |
| 285 | 240 | 261 | 251 |
| 300 | 265 | 260 | 260 |
| 300 | 265 | 260 | 260 |
| 300 | 255 | 262 | 258 |
| 270 | 250 | 265 | 255 |
| 240 | 250 | 257 | 249 |
| 270 | 235 | 265 | 249 |
| 270 | 250 | 265 | 253 |
| 285 | 270 | 262 | 252 |
| 275 | 190 | 257 | 251 |
| 300 | 290 | 257 | 254 |
| 270 | 170 | 224 | 249 |
| 225 | 160 | 225 | 250 |
| 225 | 240 | 217 | 251 |
| 225 | 190 | 209 | 248 |
| 230 | 270 | 208 | 248 |
| 230 | 260 | 205 | 249 |
| 225 | 280 | 207 | 247 |
| 225 | 260 | 206 | 248 |

Wind Speed (m/sec)

| H.J. | L.S. | C-H | W-H |
|---|---|---|---|
| 4.8 | 2.0 | 8.5 | 16.5 |
| 3.0 | 1.4 | 8.5 | 14.8 |
| 5.0 | 1.1 | 8.9 | 15.2 |
| 2.0 | 1.1 | 5.8 | 13.4 |
| 3.0 | 1.1 | 6.3 | 13.9 |
| 4.8 | 1.6 | 11.2 | 13.4 |
| 9.1 | 2.0 | 17.9 | 14.8 |
| 8.6 | 1.8 | 14.3 | 13.9 |
| 7.0 | 1.8 | 13.4 | 12.1 |
| 2.3 | 1.8 | 12.5 | 11.2 |
| 1.6 | 1.6 | 8.9 | 10.3 |
| 2.3 | 1.4 | 6.3 | 11.6 |
| 2.3 | 1.4 | 8.9 | 10.3 |
| 5.0 | 1.6 | 11.6 | 11.6 |
| 4.5 | 1.1 | 5.8 | 10.7 |
| 4.5 | 1.1 | 4.5 | 10.3 |
| 3.0 | 1.1 | 4.9 | 11.6 |
| 2.0 | 0.9 | 4.5 | 11.6 |
| 1.6 | 0.9 | 5.4 | 11.6 |
| 3.9 | 0.9 | 6.7 | 13.0 |
| 6.8 | 1.4 | 7.6 | 13.0 |
| 6.1 | 1.4 | 7.2 | 13.9 |
| 5.9 | 1.6 | 6.3 | 13.9 |
| 5.0 | 1.4 | 4.9 | 14.3 |

Date 03/06/79

$SO_2$ Concentration (ppm)

| M.C. | H.J. | L.S. | C-H |
|---|---|---|---|
| .00 | .09 | .00 | .00 |
| .00 | .15 | .00 | .00 |
| .00 |  | .00 | .00 |
| .00 | .02 | .00 | .00 |
| .00 | .00 | .00 | .00 |
| .00 | .00 | .00 | .00 |
| .28 | .00 | .00 | .00 |
| .28 | .00 | .00 | .00 |
| .12 | .00 | .00 | .00 |
| .16 | .01 | .00 | .00 |
| .00 | .00 | .00 | .00 |
| .00 | .01 | .00 | .00 |
| .00 | .00 | .00 | .00 |
| .00 | .00 | .00 | .00 |
| 0.1 | .00 | .00 | .00 |
| .00 | .00 | .00 | .00 |
| .00 | .07 | .00 | .00 |
| .00 | .23 | .01 | .00 |
| .00 | .45 | .01 | .00 |
| .00 | .39 | .01 | .00 |
| .00 | .55 | .01 | .00 |
| .00 | .60 | .00 | .00 |
| .00 | 1.00 | .00 | .00 |
| .00 | .68 | .00 | .00 |

DATE 03/07/79

|  |  |  |  |
|---|---|---|---|
| 225 | 300 | 189 | 248 |
| 225 | 250 | 197 | 251 |
| 225 | 260 | 201 | 250 |
| 225 | 255 | 210 | 249 |
| 225 | 315 | 199 | 247 |
| 220 | 345 | 212 | 244 |
| 215 | 250 | 217 | 245 |
| 215 | 265 | 222 | 246 |
| 240 | 240 | 229 | 250 |
| 240 | 280 | 226 | 244 |
| 225 | 125 | 221 | 246 |
| 225 | 245 | 235 | 245 |
| 270 | 265 | 253 | 261 |
| 290 | 275 | 273 | 268 |
| 270 | 270 | 274 | 281 |
| 290 | 270 | 272 | 274 |
| 290 | 270 | 268 | 268 |
| 280 | 265 | 263 | 264 |
| 285 | 265 | 265 | 265 |
| 300 | 265 | 263 | 266 |
| 300 | 260 | 264 | 267 |
| 285 | 270 | 266 | 276 |
| 285 | 270 | 265 | 270 |
| 300 | 270 | 273 | 274 |

|  |  |  |  |
|---|---|---|---|
| 4.8 | 1.1 | 4.0 | 13.0 |
| 4.3 | 1.1 | 4.0 | 13.4 |
| 4.3 | 1.4 | 6.8 | 14.8 |
| 5.0 | 1.4 | 5.4 | 16.5 |
| 5.7 | 1.1 | 5.4 | 15.2 |
| 8.4 | 1.4 | 7.6 | 17.9 |
| 9.1 | 1.4 | 10.7 | 19.7 |
| 7.5 | 1.4 | 15.6 | 18.3 |
| 5.9 | 1.6 | 13.4 | 13.4 |
| 3.2 | 1.4 | 8.9 | 13.0 |
| 3.2 | 1.1 | 7.2 | 11.6 |
| 5.9 | 2.0 | 7.2 | 8.0 |
| 5.7 | 2.5 | 13.0 | 13.0 |
| 9.1 | 3.4 | 17.9 | 12.1 |
| 6.6 | 3.0 | 13.4 | 13.9 |
| 8.0 | 2.5 | 14.8 | 12.1 |
| 5.9 | 2.3 | 13.9 | 10.7 |
| 4.5 | 2.0 | 13.4 | 10.3 |
| 3.0 | 2.3 | 12.5 | 8.0 |
| 5.2 | 1.8 | 14.3 | 10.3 |
| 4.8 | 2.0 | 12.5 | 10.3 |
| 4.3 | 1.6 | 8.9 | 9.4 |
| 7.3 | 2.3 | 14.6 | 15.2 |
| 4.3 | 2.5 | 15.6 | 14.3 |

|  |  |  |  |
|---|---|---|---|
| .00 | 1.40 | .00 | .00 |
| .00 | 1.26 | .00 | .01 |
| .00 | .26 | .00 | .00 |
| .00 | .99 | .00 | .00 |
| .00 | 1.51 | .00 | .00 |
| .00 | .74 | .00 | .00 |
| .00 | .29 | .00 | .01 |
| .00 | .28 | .01 | .00 |
| .00 | .10 | .00 | .00 |
| .00 | .01 | .00 | .00 |
| .00 | .05 | .00 | .00 |
| .02 | .02 | .00 | .00 |
| .16 | .01 | .00 | .00 |
| .60 | .00 | .00 | .00 |
| .80 | .00 | .00 | .00 |
| .80 | .00 | .00 | .00 |
| .60 | .00 | .00 | .00 |
| .20 | .00 | .00 | .00 |
| .32 | .00 | .00 | .00 |
| .40 | .00 | .00 | .00 |
| .30 | .00 | .00 | .00 |
| .36 | .00 | .00 | .00 |
|  | .00 | .00 | .00 |
|  | .00 | .00 | .00 |

MC - Mill Creek Site
HJ - Highway Junction Site
LS - Lincoln School Site

C-H - C-Hill Site
W-H - Weather Hill Site
WO - Water Office

```
                                              THE ANACONDA COMPANY
                                            MONTANA MINING DIVISION
                                             ANACONDA OPERATIONS

DATE:  3/ 6/79                                   DAILY REPORT                                      JULIAN DAY:  65

                                                STACK MONITORS

     0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400  AVG

STATION #9    MAIN STACK

FLOW  360  336  334  330  334  323  325  331  310  307  343  344  341  342  342  395  395  402  396  399  406  402  401  362  357
ACFM ,857 ,925 ,392 ,167 ,583 ,054 ,894 ,814 ,240 ,683 ,746 ,624 ,751 ,553 ,862 ,072 ,309 ,660 ,435 ,612 ,100 ,791 ,215 ,330 ,653
TEMP  159  156  154  154  154  154  153  153  146  147  156  159  158  159  157  164  165  167  165  166  167  166  165  160  159
PRES-1.76-1.70-1.79-1.71-1.66-1.76-1.90-1.86-1.79-1.77-1.71-1.70-1.71-1.73-1.68-1.67-1.65-1.69-1.67-1.74-1.72-1.70-1.66-1.65-1.72
BARO 2426 2427 2427 2429 2429 2428 2427 2429 2430 2431 2432 2433 2433 2432 2432 2432 2431 2431 2431 2430 2429 2426 2425 2424 2429
FLOW  244  229  229  225  228  227  229  227  215  213  224  224  232  233  233  259  266  270  266  269  272  269  269  244  242
SCFM ,740 ,693 ,509 ,973 ,766 ,574 ,745 ,247 ,278 ,149 ,615 ,735 ,677 ,600 ,876 ,679 ,084 ,064 ,542 ,310 ,021 ,879 ,027 ,798 ,774

SO2 EMITTED
   % 3.93 3.93 3.33 2.95 2.90 3.31 3.75 2.96 2.93 3.41 3.67 3.71                2.84      2.10 2.29 2.58 2.35 2.73 2.74 3.34 3.05
PNDS   97   91   79   69   68   78   89   70   63   75   89   90                  76        59   63   72   66   76   76   85   78
     ,250 ,459 ,005 ,299 ,925 ,209 ,654 ,287 ,546 ,679 ,660 ,694                ,261      ,095 ,436 ,024 ,539 ,687 ,746 ,169 ,830

PARTICULATE EMITTED
UG/M
PNDS

150 FT STACK TEMP
HIGH  142  143  144  144  144  145  146  145  149  151  148  147  149  147  148  147  147  145  145  140  139  139  138  140
 AVG  141  141  142  143  143  143  144  144  146  149  147  147  147  146  146  146  146  145  141  139  139  138  139  139  143
 LOW       141  141  142  142  142  143  143  143  147  147  147  145  146  145  146  145  145  139  139  139  137  138  138

450 FT STACK TEMP
HIGH  151  152  152  153  153  153  137  136  137  139  135  135  135  136  136  136  136  134  150  150  150  149  149  149
 AVG  150  151  151  151  152  151  136  135  133  137  134  135  134  135  135  135  134  133  143  150  149  149  149  149  142
 LOW       150  150  151  151  138  135  133  130  134  133  134  134  134  134  135  134  133  137  149  149  149  149  149


STATION #10     ACID PLANT STACK

FLOW  120  119  119  118  120  121  120  120  119  120  119  120  119  118  119  120  120  121  121  121  121  120  119  119  120
ACFM ,033 ,925 ,569 ,391 ,290 ,381 ,450 ,401 ,237 ,070 ,862 ,205 ,592 ,673 ,408 ,242 ,658 ,075 ,700 ,234 ,393 ,376 ,996 ,225 ,137
TEMP  198  189  193  176  191  197  197  190  174  192  192  197  185  178  185  199  193  193  197  199  193  199  193  190  196
PRES-0.11-0.11-0.10-0.10-0.10-0.11-0.11-0.11-0.11-0.10-0.10-0.10-0.11-0.11-0.11-0.11-0.11-0.11-0.11-0.11-0.11-0.11-0.10-0.11-0.11
BARO 2448 2449 2449 2450 2451 2450 2449 2450 2452 2453 2454 2455 2455 2454 2453 2453 2453 2453 2452 2451 2449 2448 2447 2445 2451
FLOW   78   78   79   79   79   79   79   80   80   79   79   79   79   79   79   79   79   80   80   78   79   77   78   77   79
SCFM ,819 ,597 ,153 ,326 ,863 ,893 ,208 ,079 ,108 ,768 ,349 ,296 ,101 ,368 ,995 ,066 ,945 ,324 ,160 ,507 ,093 ,661 ,114 ,889 ,195

SO2 EMITTED
PPM   927  770  625  526  498  656  745  546   95   97  337  159  242  335  779  643  572  471  509  557  506  616  588  797  550
PNDS  678  628  515  433  414  545  614  453        81  275  131            640  529  475  394  423  455  417  496  478  645  472
```

```
DATE  [illegible]                               DAILY REPORT                                   JULIAN DAY [illegible]

                                                STACK MONITORS

       0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400  AVG

STATION #9     MAIN STACK

FLOW   270  295  292  295  394  396  389  385  355  239  265  298  297  289  284  312  313  316  319  325  444  502  504  502  352
ACFM  ,247 ,906 ,372 ,230 ,976 ,590 ,161 ,626 ,884 ,536 ,294 ,117 ,140 ,291 ,667 ,336 ,390 ,300 ,801 ,766 ,907 ,729 ,474 ,172 ,311
TEMP   161  164  163  162  163  164  163  162  165  193  191  192  191  189  186  199  193  195  195  193  176  176  177  172  172
PRES-1.65-1.62-1.57-1.60-1.66-1.75-1.77-1.94-1.75-1.75-1.72-1.70-1.91-2.03-2.02-1.91-1.88-1.92-1.99-1.90-1.96-1.97-2.06-1.97-1.82
BARO  2422 2421 2420 2419 2416 2414 2411 2408 2410 2408 2405 2403 2402 2403 2404 2405 2405 2405 2405 2406 2406 2406 2405 2404 2409
FLOW   249  257  256  253  258  253  260  259  237  154  169  183  183  184  182  199  199  200  202  207  291  329  329  329  235
SCFM   910 ,842 ,829 ,694 ,219 ,780 ,209 ,122 ,629 ,481 ,634 ,701 ,076 ,697 ,910 ,870 ,496 ,715 ,424 ,459 ,059 ,626 ,150 ,969 ,192

SO2 EMITTED
  %   4.07 3.49 2.26 2.25 3.15 3.29 3.05 2.58 1.53 4.14 1.38 0.74 2.35 4.64 4.05 3.10 3.18 3.39 4.12 4.08 3.70 3.01 2.92 2.49 3.10
PNDS   105   93   60   60   84   88   82   69   37   66   23   14   44   89   78   64   65   70   86   87  111  103   96  119  107
      ,964 ,490 ,497 ,706 ,691 ,367 ,629 ,081 ,894 ,561 ,756 ,140 ,225 ,213 ,172 ,327 ,963 ,479 ,814 ,909 ,027 ,194 ,649 ,905  570

PARTICULATE EMITTED
UG/M
PNDS

150 FT STACK TEMP
HIGH   141  141  141  139  139  141  142  142  144  151  152  151  151  149  148  148  148  149  148  144  143  142  141  139
 AVG   140  141  140  138  138  138  141  141  142  144  151  149  149  149  146  146  147  148  146  143  141  141  140  139  143
 LOW        140  140  138  138  138  141  141  141  142  150  147  147  148  143  145  146  147  143  143  139  140  139  139

450 FT STACK TEMP
HIGH   150  151  152  149  149  149  134  130  132  134  139  138  139  137  136  136  136  137  154  153  153  152  151  150
 AVG   149  150  150  149  149  147  132  129  130  132  137  136  137  135  134  135  135  136  144  153  151  151  150  149  142
 LOW        150  149  149  149  132  129  128  129  128  135  134  135  135  131  133  135  135  134  153  150  151  149  149


STATION #10     ACID PLANT STACK

FLOW   120  120  120  120  119  119  119  119  121  116  121  121  119  117  115  115  116  112  112  113   69    0    0    0  101
ACFM   254 ,254 ,722 ,624 ,947 ,470 ,776 ,776 ,748 ,382 ,173 ,160 ,997 ,644 ,316 ,329 ,469 ,314 ,437 ,932 ,832 ,294 ,404 ,291 ,440
TEMP   190  190  190  175  179  190  190  175  169  172  190  177  181  190  193  177  196  197  193  196  199  111  100  100  173
PRES-0.10-0.10-0.11-0.11-0.10-0.11-0.11-0.10-0.10-0.10-0.10-0.10-0.09-0.10-0.09-0.10-0.10-0.10-0.10-0.10-0.10-0.10-0.09-0.09-0.10
BARO  2444 2442 2442 2439 2439 2436 2433 2429 2431 2430 2427 2425 2424 2424 2426 2426 2427 2427 2427 2427 2429 2429 2427 2426 2431
FLOW    79   79   80   80   79   78   79   79   81   77   79   80   78   76   75   75   76   72   72   73   44    0    0    0   66
SCFM  ,570 ,509 ,060 ,491 ,671 ,959 ,163 ,642 ,836 ,733 ,847 ,149 ,829 ,232 ,584 ,307 ,087 ,131 ,603 ,276 ,299 ,217 ,304 ,212 ,626

SO2 EMITTED
PPM   1066  799  439  475  725  815  636  525  294 1180  245  114  370 1336 1040  640  569  608  750  710  498  120  174  255  530
PNDS   971  651  365  397  599  669  523  435  248  953  203   95  300       817  507  450  460  566  541  302    0    1    1  459
```